TABLE OF CONTENTS

1. SPECIAL FEATURES

This microcard contains the trouble-shooting instructions for air conditioners for the following models valid at the time of printing:

Lancia, Thema of end of 1984

Air conditioner control unit is equipped with self-diagnosis.

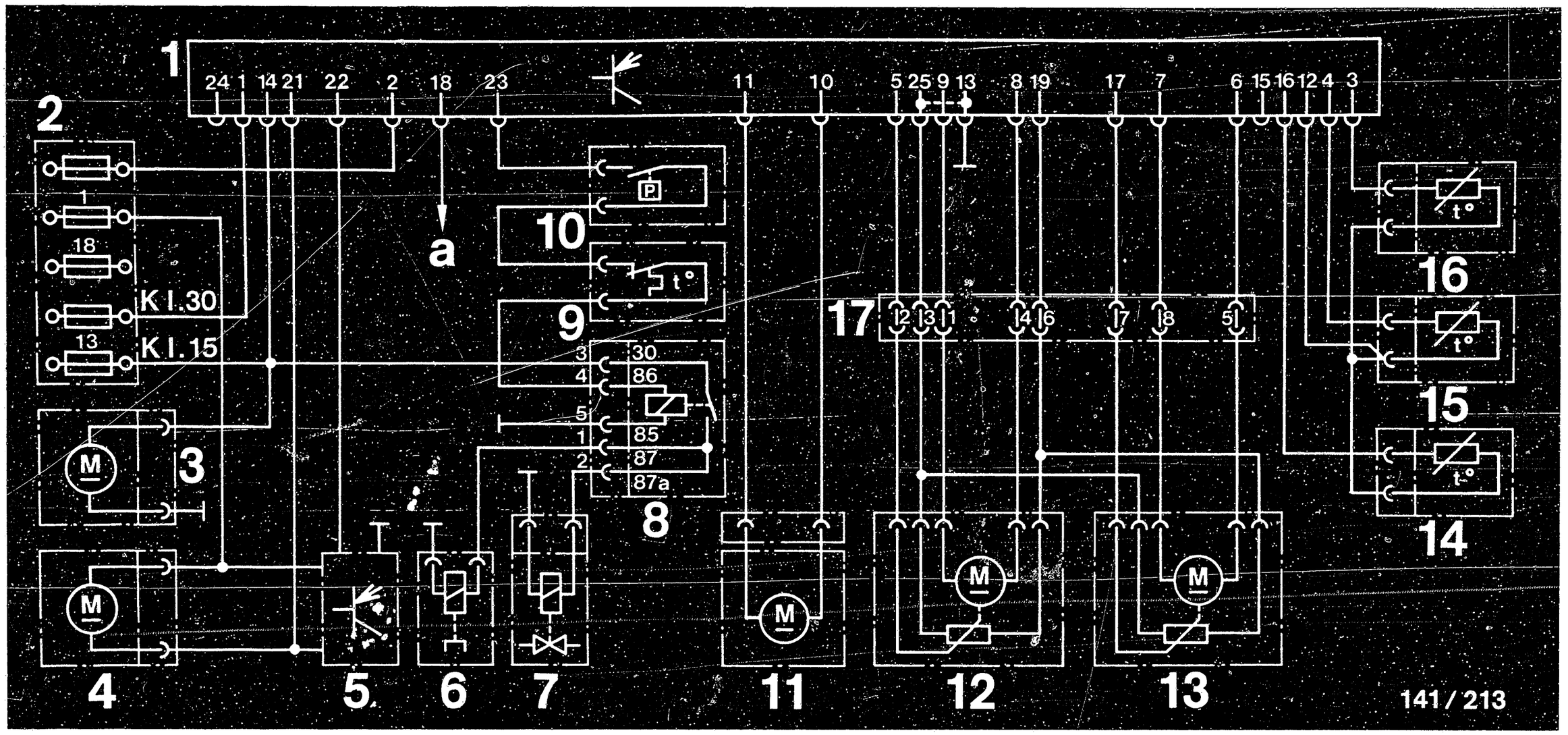
Note:

The air conditioner in the Lancia Thema is basically the same as that in the Saab 9000.

Similar SIS repair instructions:
Microcard SAA-502.

2. TEST SPECIFICATIONS

Control voltage for blower controller	Speed 1: approx. 0.7 V Speed 2: approx. 1.2...1.6V Speed 3: approx. 3.0...5.0V
Passenger-compartment temperature sensor	16...8 kΩ at 15...20°C at temperature sensor
Outside temperature sensor	922 Ω ... 1 kΩ at 15...30°C at temperature sensor
Blow-in temperature sensor	12.5...8 kΩ at 20...30°C at temperature sensor
Feedback potentiometer in the servo-motors:	
Total resistance	approx. 1.9...2.8 kΩ
Resistance in servo range	approx. 1.0...2.4 kΩ
Control unit power supply	12...14V
Winding resistance of servo-motors	< 100 Ω



3. ELECTRICAL TERMINAL DIAGRAM

1 = Electronic control unit with control panel
2 = Fuse box
3 = Suction blower for air admission to passenger-compartment temperature sensor
4 = Blower motor
5 = Blower controller
6 = Refrigerant compressor clutch
7 = Electric valve for idle-speed increase
8 = Compressor relay
9 = Icing-protection switch
10 = Pressure switch
11 = Fresh-air/recirculated-air flap drive
12 = Air distributor flap drive
13 = Mixing flap drive
14 = Outside-temperature sensor
15 = Blow-in temperatures senosor
16 = Passenger-compartment temperature sensor
17 = Flap servo plug
a = To brightness control for instrument illumination

4. GENERAL INTRODUCTION

Automatically controlled air conditioner (ACC)

The passenger-compartment temperature is regulated via the electronic control unit.
With the temperature selector buttons it is possible to set the desired passenger-compartment temperature in stages between two limits (low and high). The set temperature is indicated by two LED digits.

In the control unit the preselected temperature (setpoint) is compared with the temperature measured by the passenger-compartment temperature sensor (actual value).
Depending on the deviation from the set setpoint, with the system set to "AUTO" the heater mixer flap, the air distributor flap and the fresh-air/recirculated-air flap are adjusted or the refrigerant compressor switched on via servo-motors as a function of the blow-in and outside temperatures.

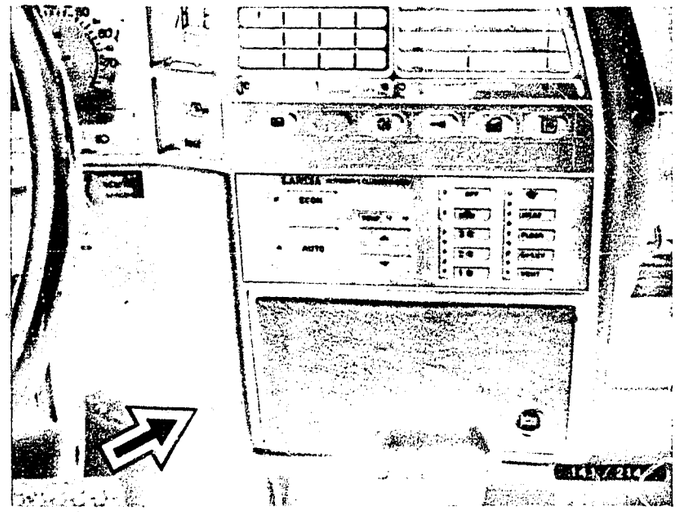
Via potentiometers built into the servo-motors, the position of the mixer flap and the position of the air distributor flap are fed back to the control unit.
With the system set to "ECON" the refrigerant compressor is switched off; the passenger compartment is cooled by the supply of fresh air.

The blower speed, the air distribution and the fresh-air/recirculated-air flap are automatically controlled by the control unit. Intervention in the control system can be effected by way of the operator control buttons.
The air conditioner is switched off by means of the "OFF" button.

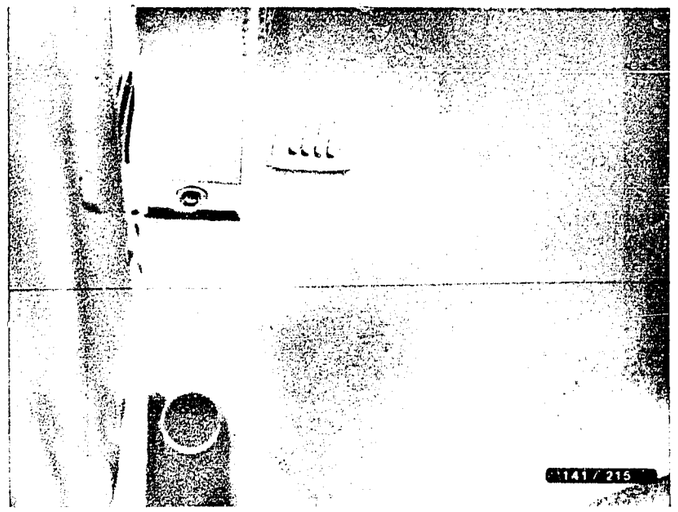
5. TEST EQUIPMENT, TOOLS AND AUXILIARIES

Multimeter ETE 014.00 or e.g. Pontavi	0 684 101 400 commercially available
Refrigerant spray	commercially available
Measuring leads	KDZS 0005
Thermal-conduction paste	5 942 860 003

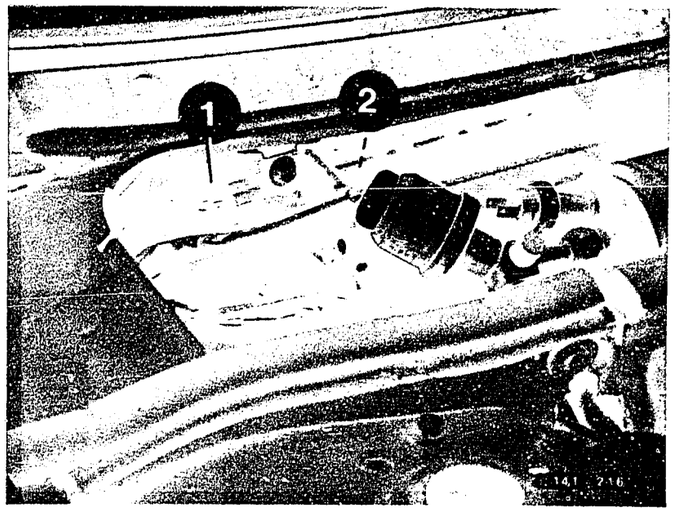
6. INSTALLATION POSITION OF COMPONENTS



Control panel with built-in control unit is installed in the center console (see top picture). To remove, take out radio/tray insert and force control unit out of holding clamps from rear.



Passenger-compartment temperature sensor is mounted in the left-hand footwell next to the center console (see center picture; or top picture, arrow). Air is admitted to the passenger-compartment temperature sensor via a suction blower (installed behind the glove compartment on the servo-motor unit).



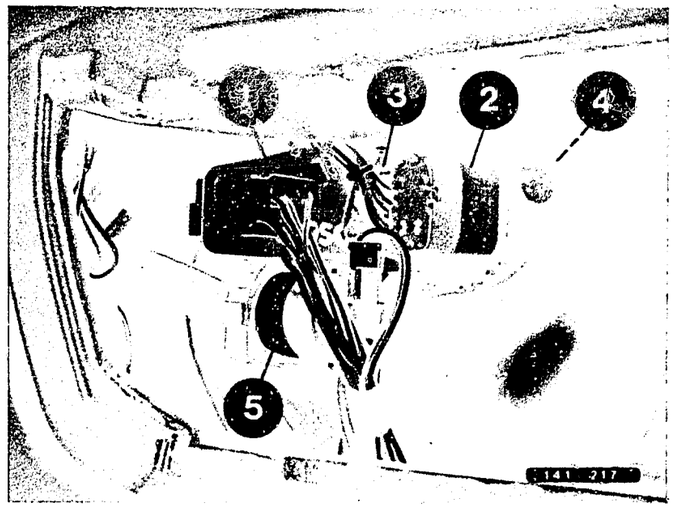
Outside-temperature sensor is screwed onto the outside of the blower box (see bottom picture, - 2 -).

The motor for the fresh-air/recirculated-air flap (1) is installed in the engine compartment on the right under the cover (removed in picture, see bottom picture).

The flap servo-unit consists of
air distributor flap drive (top picture - 1 -) and mixing flap drive (2). The flap servo-unit is mounted under the glove compartment on the heater box.
To remove/install, remove glove compartment.

The flap servo-unit is mounted on the heater box by 2 screws.
The mixing flap is adjusted via the cable - 3 - (see top picture); the air distributor flap is adjusted via the servo-drive - 4 -.

The suction blower (5) for the admission of air to the passenger-compartment temperature sensor is mounted behind the glove compartment on the flap servo-unit (see top picture).

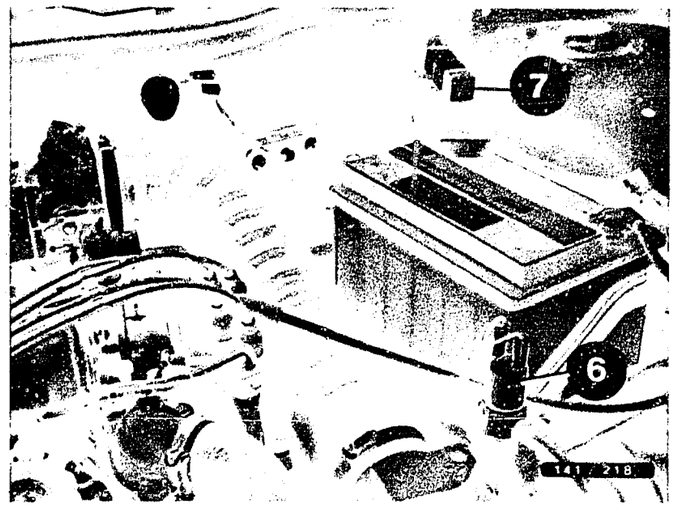


The blow-in temperature sensor (not shown) is clipped into the heater box opposite the flap servo-unit.

To remove, apply screwdriver between blow-in temperature sensor and heater box and force out blow-in temperature sensor.

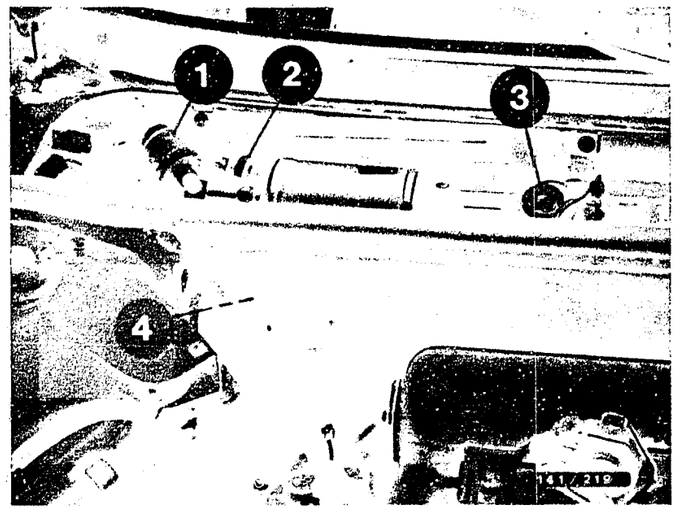
The changeover valve for idle-speed increase is mounted next to the air-flow sensor on the battery bracket (see bottom picture - 6 -).

The compressor relay (7) is mounted on the left-hand firewall behind the battery (see bottom picture).



The (1) high-pressure, (2) low-pressure and (3) icing-protection switches are installed in the engine compartment behind the cover (already removed in picture).

The blower controller in the heat sink is mounted on the evaporator housing, behind the intermediate wall (4). To remove/install, remove the intermediate wall.

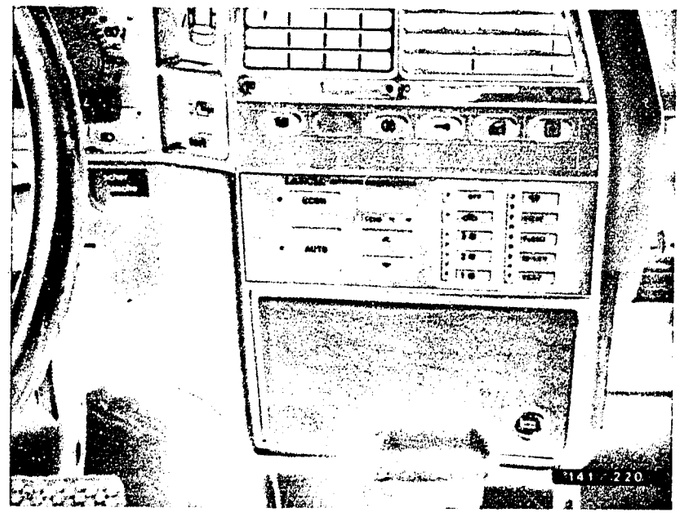


7. TROUBLE-SHOOTING:

7.1 How to operate the self-diagnosis

This vehicle is equipped with a control unit that has a self-diagnosis feature.
Therefore, whenever testing, begin with the self-diagnosis.
Coordinate A 15 describes how to activate the self-diagnosis.
The self-diagnosis test table starting on Coordinate A 17 contains fault indication, cause of fault and test instructions for direct trouble-shooting.

7.2 Activating the self-diagnosis



Test conditions: battery fully charged, coolant and refrigerant levels O.K.

General:

The self-diagnosis detects and indicates faults in the hardware of the control unit, in sensors and servo-drives connected to the control unit and in the wiring of such sensors and servo-drives. The fault indication is output via the temperature display on the control unit.

The indicated faults are noted by the mechanic and are rectified with the aid of the self-diagnosis test table.

Activating the self-diagnosis:

Switch on ignition.
Simultaneously press "AUTO" and "VENT" buttons, then release "AUTO" button first. All segments of the display flash. After running through the self-diagnosis, the display shows the number of faults detected in the system.
By pressing the "VENT" button it is possible to read out the individual faults one after the other.
After the last fault has been read out, pressing the "VENT" button once again returns the control unit to its normal operating program.

7.3 Self-diagnosis test table

Fault indication	Cause of fault	Test instructions	Notes on fault rectification
1 U	Passenger-compartment temperature sensor	Open circuit in sensor lead. Passenger-compartment temperature sensor defective.	Eliminate open circuits/short circuits on sensor leads. Replace temperature sensor.
1 C		Short circuit in sensor lead. Passenger-compartment temperature sensor defective.	
2 U	Outside-temperature sensor	Open circuit in sensor lead. Outside-temperature sensor defective.	Eliminate open circuits/short circuits on sensor leads. Replace temperature sensor.
2 C		Short circuit in sensor lead. Outside-temperature sensor defective.	
3 U	Blow-in temperature sensor	Open circuit in sensor lead. Blow-in temperature sensor defective.	
3 C		Short circuit in sensor lead. Blow-in temperature sensor defective.	
5 U	Mixing-flap drive	Open circuits/short circuits in motor and feedback-potentiometer circuits; blocking of servo-drive. Feedback potentiometer incorrectly set.	Eliminate open circuits/short circuits on leads; adjust feedback potentiometer. Replace motor. Swap over motor connecting leads.
5 C		Motor direction of rotation incorrect	
6 U	Air distributor flap drive	Open circuits/short circuits in motor and feedback-potentiometer circuits; blocking of servo-drive.	
6 C		Motor direction of rotation incorrect	

Self-diagnosis test table (continued)

Fault indication	Cause of fault	Test instructions	Notes on fault rectification
7 U	Fresh-air/ recirculated-air flap drive	Open circuit/short circuit to ground phase 1 or 2	Eliminate open circuits/short circuits on leads. Replace fresh-air/ recirculated-air flap drive.
7 C		Short circuit in motor or motor blocked	
9 U	Refrigerant compressor clutch relay	Open circuit in relay, relay base or open circuit in leads or plug dropped off relay or corroded.	Eliminate open circuits/short circuits. Replace compressor clutch relay. Replace control unit.
9 C		Short circuit in compressor energization lead or in relay base.	
AU	Blower control and blower motor	Open circuit/short circuit in U_M lead. Blower motor blocked. Open circuit in U_{St} lead. Blower controller defective.	Eliminate open circuits/short circuits on leads to blower controller and blower motor. Replace blower motor. Replace blower controller. Replace air conditioner control unit.
AC		Short circuit in U_{St} lead. Blower controller defective.	
EU	Control unit	Control unit defective.	Replace air conditioner control unit.

Table of contents MB-507

Mercedes Benz 190 E 2,3-16 4.84 →

1. Special features

The 4-cylinder fuel-injection engine of the Mercedes Benz 190 E 2.3-16, with two overhead camshafts and 4 valves per cylinder, has been derived from the engine M 102 in the well-known type 190 E.

Except for deviations in values, the KE-Jetronic in this model is the same, with regards to the actual fuel-injection portion, as the basic model already used in the type 190 E. See also microfiche card SIS MB 501.

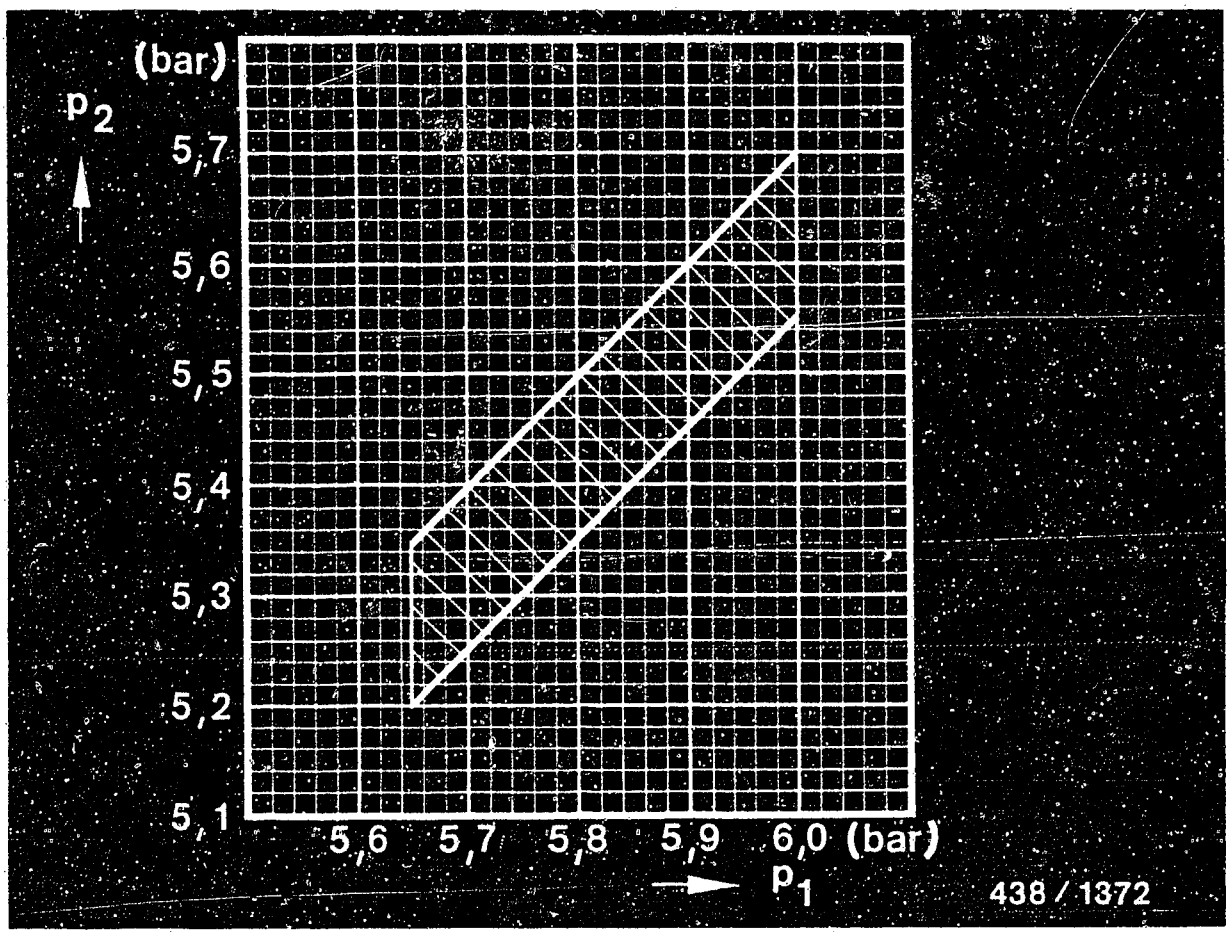
In addition to the basic functions of the KE-Jetronic, the induction of fuel in the 190 E 2.3-16 has the following special features:

- Idle speed control. Control electronics integrated into the KE-control unit.
- Cold start control. The start valve is triggered by a supplemental function of the triggering relay for the electric fuel pump. There is no thermotime switch.
- Air-shrouding of the fuel-injection valves.
- Engine speed limitation by means of ignition cutoff.

2. Test specifications

Test step	Test specifications *
2.1 Electric fuel pump:	
Fuel delivery:	min. 1100 cm^3/min.
2.2 Fuel pressures:	
Primary pressure	5.65...6.0 bar (5.75...6.1 kgf/cm^2)

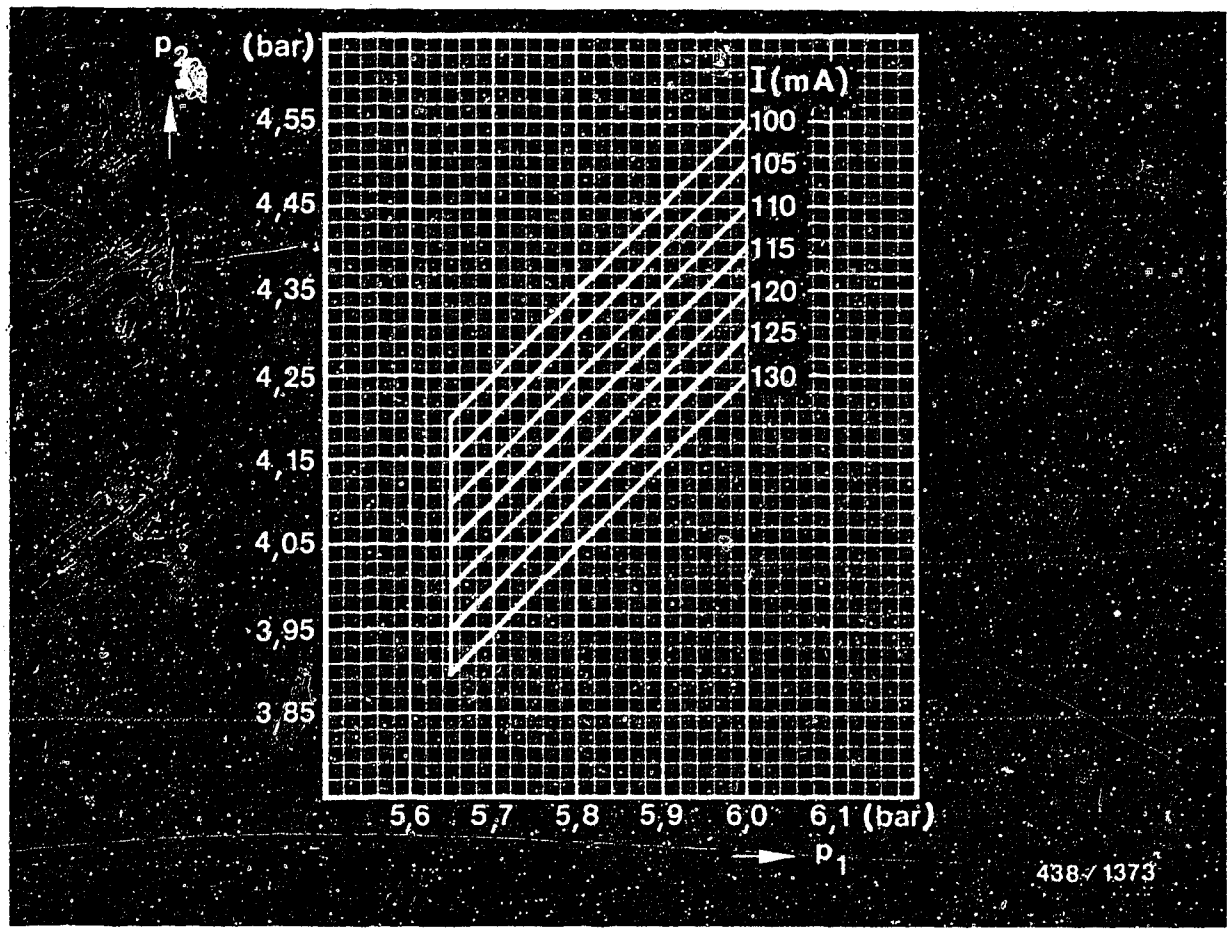
* Pressures indicated in test specifications in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).



p_1 = Primary pressure
p_2 = Lower chamber pressure, actuator current = 0 mA

Differential pressure:
(Primary pressure/lower chamber pressure)

Obtain the specified value for "warm" lower chamber pressure from the diagram to correspond to the primary pressure as measured. The "warm" condition is simulated by disconnecting the lead plug on the pressure actuator (actuator current 0



p_1 = Primary pressure
p_2 = "Cold" lower chamber pressure. Tolerance $\pm$ 0.15 bar
I^2 = Actuator current

Obtain the specified value for "cold" lower chamber pressure from the diagram to correspond to the primary pressure as measured and the actuator current as measured. The "cold" condition is simulated by disconnecting the lead plug at the temperature sensor (NTC). Connect the lead plug at the pressure actuator.

Test step	Test specifications*
2.3 Test for leaks on the fuel system as a whole:	
Minimum pressure after 10 mins.:	3.1 bar (3.2 kgf/cm²)
after 20 mins.:	3.0 bar (3.1 kgf/cm²)
2.4 Fuel-injection valves	
Opening pressure	3.0 ... 4.1 bar (3.1 ... 4.2 kgf/cm²)
2.5 Fuel distributor test: (Testing with pressure actuator attached. Pressure actuator with no current.)	
Comparative measurement of fuel deliveries from the outlets	Setting point / Max. allowable fuel delivery
Idle:	6.0 cm³/min. / 6.6 cm³/min.
Part load:	40.0 cm³/min. / 42.5 cm³/min.
Full load:	100.0 cm³/min. / 109.0 cm³/min.
Full load delivery with maximum deflection of the air-flow sensor plate, measured with a graduate at the outlet with the least fuel delivery at the full-load measuring point:	min. 209 cm³/min.
Through flow through the KE-restriction in the fuel distributor:	130 ... 145 cm³/min.

* Pressures indicated in test specifications in bar (gauge pressure) and/or in kgf/cm² (gauge pressure).

Test step	Test specifications
2.6 Temperature sensor Measurements of resistance:	
Engine cold. Ambient temperature (+15°C...+30°C):	1300...3600 Ω
Engine at normal operating temperature (approx. +80°C):	250...390 Ω
2.7 Air-flow sensor potentiometer: Voltage signal with air-flow sensor plate in basic setting:	0.2 ... 0.3 V
2.8 Idle-mixture-adjusting screw Basic setting (Fuel-distributor seat for needel-roller bearing):	21.1...21.3 mm

2.9 Idle adjustment*

Idle speed (set by control):	850 ... 950 min^{-1}
With on/off ratio to be set:	27 ... 29 %
CO-level in exhaust at idle:	0.5 ... 1.5 Vol %

---

* Instructions for idle adjustment:

In addition to the usual test equipment, the following are needed:

- Measuring instrument for on/off ratio, e.g., Bosch lambda closed-loop control tester KDJE-P 600, or Bosch Pocket-Motortester KTE 001.03
- Bosch universal test adapter ETT 018.01, with KE-Jetronic test lead 1 684 463 135.

Connection of KDJE-P 600: directly to B+ and ground, blue measuring lead to red "V" socket on the adapter. Press button "IR" on the tester.

Connection for the Pocket-Tester: yellow B+, green to red "V" socket on the adapter. Switch setting: "100% }".

To measure the on/off ratio, turn the "V" switch on the adapter to setting 10.

The idle speed is automatically controlled by the idle speed control, but the on/off ratio should be checked at idle speed and, if need be, corrected by adjustment of the bypass screw on the idle actuator.

Adjustment of CO as usual, by adjusting the idle-mixture-adjusting screw in the mixture-control unit.

3. Rapid diagnostic chart for the universal test adapter ETT 018.01, with KE-Jetronic test lead 1 684 463 135 and a suitable multimeter:

The rapid diagnostic chart below makes it possible for the experienced Jetronic expert to check quickly the electrical/electronic peripheral and control unit functions of the KE-Jetronic.

Important instructions on the rapid diagnostic chart below:

The column "test conditions" shows those test steps at which the control unit plug must be connected and/or disconnected. In so doing, be absolutely certain that the ignition is switched off each time the plug is connected or disconnected.

The column "test connections" provides information on the leads wired into the pertinent test path with reference to the assignment in the control unit lead plug. Any trouble-shooting that may be required refers to these leads.

Rapid diagnostic chart for the universal test adapter ETT 018.01

Test step	Switch setting V	Switch setting Ω	Button	Test of:	Test connections	Test conditions	Test specifications (reading)
1	↓	4	-	Pressure actuator - internal resistance	12-10	Disconnect control unit lead plug.	21 ... 30 Ω
2	↓	5	-	Temperature sensor - internal resistance +15°...+30°C: approx. +80°C:	21- 2	Control unit lead plug disconnected.	1.3 ... 3.6 kΩ 250 ... 390 Ω
3	↓	11	-	Ground, control unit - output stage	20- 2	Control unit lead plug disconnected.	0 ... 10 Ω
4	3	-	-	Starting signal Terminal 50-ignition lock (only with automatic transmissions)	16- 2	Control unit lead plug disconnected. Switch starting motor on briefly:	8 ... 15 V
5	4	-	-	Starting signal Terminal 50-starting motor	24- 2	Control unit lead plug disconnected. Switch starting motor on briefly:	8 ... 15 V
6	5	-	-	TD-signal (ignition)	25- 2	Control unit lead plug disconnected. Switch starting motor on for a few seconds:	Value for voltage undefined
7	6	-	-	Control unit - power supply	1 - 2	Control unit lead plug disconnected. Switch ignition on:	8 ... 15 V

Rapid diagnostic chart for the universal test adapter ETT 018.01 (continued)

Test step	Switch setting V	Switch setting Ω	Button	Test of:	Test connections	Test conditions	Test specifications (reading)
8	7	-	-	Power supply, potentiometer on air-flow sensor	18-2	Connect control unit. Switch ignition on:	 7 ... 8 V
9	8	-	-	Signal, potentiometer on air-flow sensor	17-2	Control unit connected. Switch ignition on. Deflect air-flow sensor plate by hand, causing voltage to rise to max. 8 V	 0 ... 8 V
10	10	-	-	Idle actuator - power supply and continuity, coil 1	3-2	Switch ignition off. Disconnect control unit lead plug. Switch ignition on.	 8 ... 15 V
11	11	-	-	Idle actuator - continuity, coil 2	4-2	Control unit lead plug disconnected. Switch ignition on:	 8 ... 15 V
12	12	-	-	Signal, air conditioner (if there is one)	19-2	Control unit lead plug disconnected. Switch ignition on. Switch air conditioner on:	 8 ... 15 V
13	-	-	1	Warm-up enrichment - 20°C	12-12	Measurement of current! Connection for measuring instrument: Negative = black socket 1 Positive = black socket 2 Connect control unit. Switch ignition on:	 58 ... 79 mA

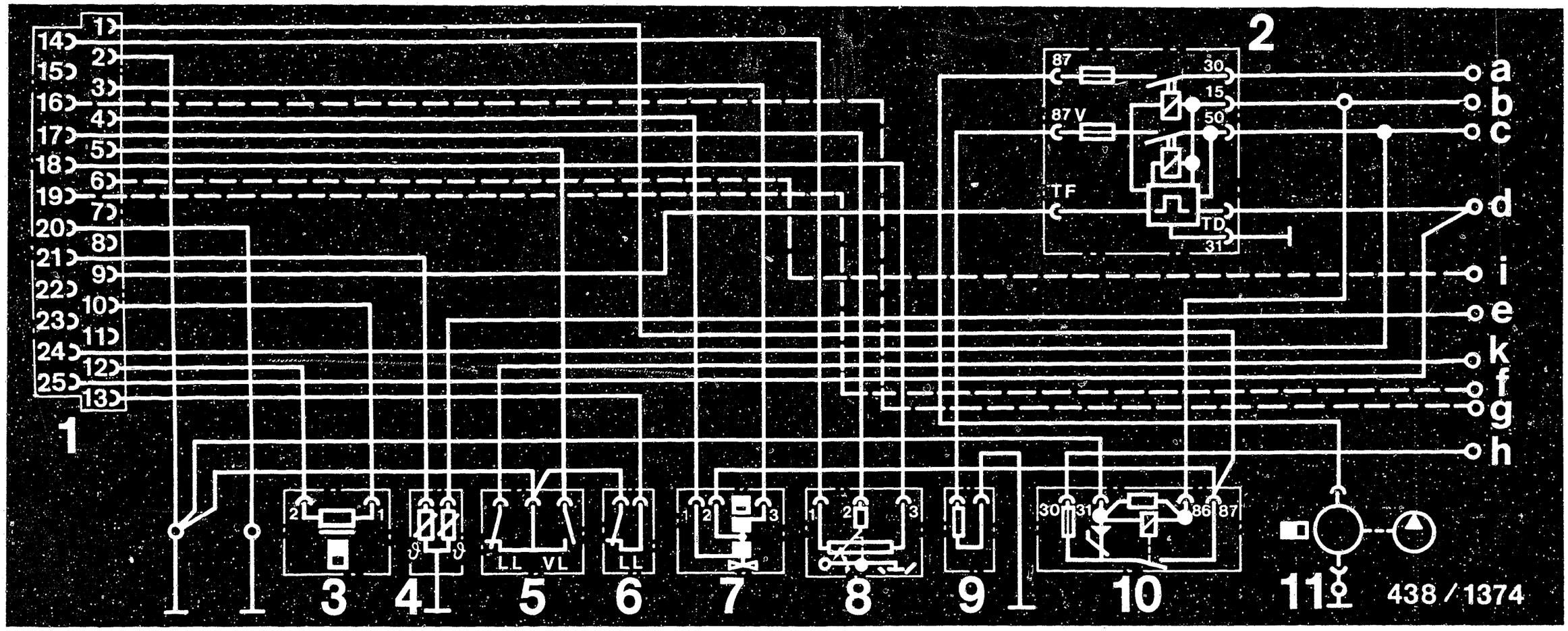
Rapid diagnostic chart for the universal test adapter ETT 018.01 (continued)

Test step	Switch setting V	Switch setting Ω	Button	Test of:	Test connections	Test conditions	Test specifications (reading)
14	-	-	2	Actuator current, corresponding to engine at normal operating temperature	12-12	Control unit connected. Switch ignition on:	 0 ... 1 mA
15	-	-	2/4	Starting enrichment	12-12	Control unit connected. Switch ignition on. Press in and hold button 2. Then press button 4. Current rises to: Cut-back time:	 64 ... 96 mA approx. 1 sec.
16	-	-	1/4	Post-start enrichment	12-12	Control unit connected. Switch ignition on. Press button 1 and hold it: Press button 4. Current rises to: After a short while, cut-back to:	 58 ... 79 mA 99 ... 139 mA 58 ... 79 mA
17	-	-	1/6	Acceleration enrichment	12-12	Control unit connected. Switch ignition on. Continue pressing both buttons: Rapidly deflect air-flow sensor plate by hand. Current rises to: Cut-back after approx. 1.5 sec. to:	 58 ... 79 mA min. 150 mA 58 ... 79 mA

Test step	Switch setting V	Switch setting Ω	Button	Test of:	Test connections	Test conditions	Test specifications (reading)
18	-	-	2	Overrun cutoff	12-12	Control unit connected. Reverse terminals on ammeter. (Interchange positive and negative. Not necessary if test instrument has automatic polarity switch-over.) Start the engine and hold it at approx. 2000 min^{-1}. While pressing button 2, operate the idle throttle-valve switch by hand. The engine hunts. Reading for current during the dropping phases of engine speed: When the cruise control is switched on (if there is one), it is not permissible for any overrun cutoff to take place. In this case, there must be a voltage of 8...15 V present at pin 6 on the control unit lead plug after the cruise control is switched on.	-40 ... -50 mA
19	-	-	2	Full-load enrichment	12-12	Control unit connected. Disconnect the lead plug for the full-load throttle-valve switch, and on the control-unit end, jump connections 2 and 3. Start the engine. Press button 2. Reading for current at idle speed: Increase engine speed. After approx. 1500 min^{-1}: From approx. 2000 min^{-1} to approx. 5500 min^{-1}:	0 ... 1 mA Increase in current 4 ... 6 mA

Rapid diagnostic chart for the universal test adapter ETT 018.01 (continued)

Test step	Switch setting V	Switch setting Ω	Button	Test of:	Test connections	Test conditions	Test specifications (reading)
20	10	-	-	Idle speed control	3	Test with duty cycle measuring instrument e.g. Bosch Lambda closed-loop control tester ETT 018.10 or KDJE-P 600, or engine tester.	
						Connection of tester: voltage supply direct to battery, measurement lead (on tester ETT 018.10 = connector marked in yellow) to red "V" socket or measuring recess of universal test adapter.	
						Switch on measuring range: press "IR" button on tester KDJE-P 600 or "50 %" button on tester ETT 018.10. Refer to corresponding operating instructions for connection and setting of engine tester.	
						Have engine at normal operating temperature and run it at idle speed.	
						Idle speed (set by the control):	850 ... 950 min^{-1}
						with on/off ratio:	27 ... 29 %
						If necessary, adjust on/off ratio (bypass screw on the idle actuator)	
						Switch on the air conditioner (if there is one):	29.5 ... 32.5 %
						Disconnect the lead plug for the idle throttle-valve switch:	28.5 ... 31.5 %
				Correction functions for idle speed control			



4. Diagram of electrical connections, with safety circuit for the electric fuel pump

1 = KE-Jetronic control unit
2 = Electronic relay to trigger electric fuel pump and start valve
3 = Electro-hydraulic pressure actuator
4 = Temperature sensor (double NTC)
5 = Double throttle valve switch
6 = Throttle valve switch (microswitch on the linkage)
7 = Idle actuator
8 = Potentiometer on the air-flow sensor
9 = Start valve
10 = Electronic relay with overvoltage protection
11 = Electric fuel pump

a = Terminal 30, multiple butt connector, engine
b = Terminal 15, central electric box, coupling U, socket 5
c = Terminal 50, multiple butt connector, engine
d = Terminal TD-ignition, multiple butt connector, diagnosis socket
e = Ignition trigger box (EZU), quadruple plug pulse generator, terminal 1
f = Signal, air conditioner (if there is one)
g = Terminal 50, ignition lock (only with automatic transmissions)
h = Terminal 30, multiple butt connector, engine
i = Signal from cruise control (if there is one)
k = Ignition trigger box (EZU), quadruple plug pulse generator, terminal 2

Jumping the electrical safety circuit:

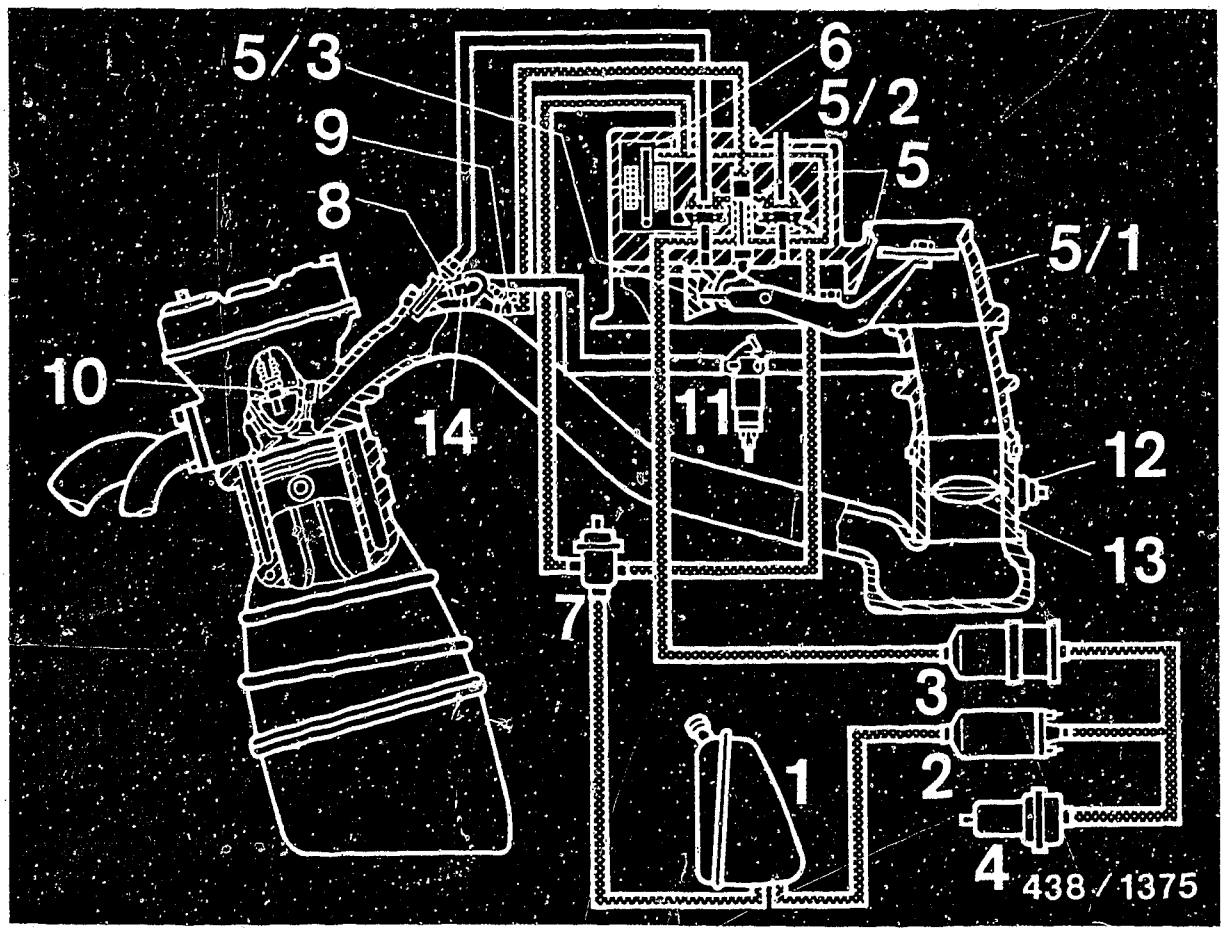
The safety circuit is to be jumped for all pressure and flow tests.

The electronic relay for the safety circuit (for the electric fuel pump and the cold-start control) is located, together with the overvoltage protection relay and the KE-control unit, in the instrument chamber (behind the battery on the right, looking in the direction of forward vehicle travel).

To jump it, disconnect the relay from the relay socket. Connect sockets 7 (87) and 8 (30) with a connecting lead (1.5 mm^2, and a fuse element with a 16 A fuse). This supplies the electric fuel pump with battery voltage.

Important instructions:

To test the functions of the control unit, it is sufficient to switch the ignition on. When that is done, the safety circuit must not be jumped. This assures that no fuel is injected when the air-flow sensor plate is moved. That would cause serious damage to the engine during a subsequent start of the engine.



5. Line diagram, fuel and idle air systems

1 = Fuel tank
2 = Fuel pump
3 = Fuel filter
4 = Accumulator
5 = Mixture-control unit
5/1 = Air-flow sensor
5/2 = Fuel distributor
5/3 = Potentiometer
6 = Pressure actuator
7 = Primary pressure regulator
8 = Fuel injection valve(s)
9 = Start valve
10 = Temperature sensor (double NTC)
11 = Idle actuator
12 = Idle/full-load throttle valve switch (microswitch on the linkage)
13 = Throttle-valve assembly
14 = Fuel distribution pipe - air shrouding

6. Installation position of the components

Mixture-control unit:	above the intake manifold and the throttle-valve assembly, similar to Type 190 E
Primary pressure regulator:	between intake tubes 1 and 2
Fuel-injection valves:	like Type 190 E
Electric fuel pump, filter, accumulator:	on a single support on the floor of the vehicle, in front of the rear axle on the left
Temperature sensor (NTC):	on the cylinder head in front (double connection)
Control unit, overvoltage protection, engine speed relay for the safety circuit:	in the instrument chamber, behind the battery on the right
Idle actuator:	under intake tube 3
Idle/full-load throttle-valve switch:	on the throttle valve assembly, throttle shaft
Idle microswitch:	on the accelerator linkage, in front of the mixture-control unit

TABLE OF CONTENTS

1. SPECIAL FEATURES

The 4-cylinder gasoline-injection engine of the Mercedes Benz 230 E (type 124.023) is derived from engine M 102 of the known 190 E model.

Engine type: 102.982, power output: 100 kW/136 HP (DIN)

The KE-Jetronic in this model is the same as the basic version of the type already used in the 190 E model as regards the actual gasoline-injection part, with the exception of some deviating specification values. See microcard SIS MB 501.

In addition to the basic functions of the KE-Jetronic, the fuel management system of the 230 E model contains the following special features:

- Idle speed control. Control electronics integrated in KE control unit.

- Cold-start control. The start valve is energized by an additional function of the engine-speed relay for the electric fuel pump. There is no thermo-time switch.

- Engine-speed limitation at approx. 6200 min^{-1} by reversing the polarity of the current as with overrun cutoff.

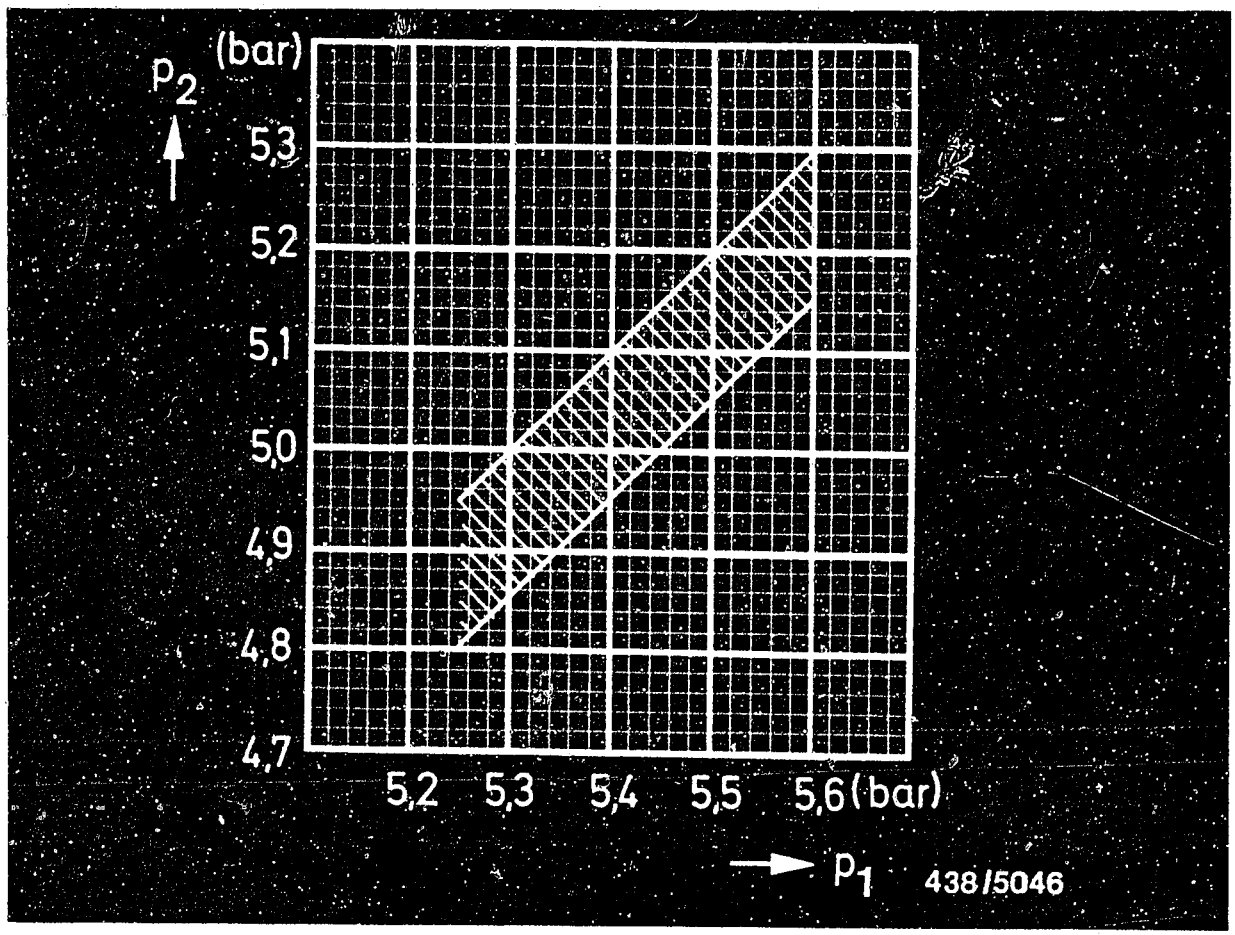
- With automatic transmissions, kickdown cutoff approx. 200 min^{-1} below maximum full-load speed. Control by additional function of engine-speed relay for the electric fuel pump.

  Note: Different versions of relay for vehicles with manual and automatic transmission.

2. TEST SPECIFICATIONS

Test step	Test specifications *
2.1 Electric fuel pump:	
Fuel delivery:	min. 1100 cm^3/min.
2.2 Fuel pressures:	
Primary pressure	5.25...5.6 bar (5.35...5.7 kgf/cm^2)

* Pressures in the test specifications are given in bar (gauge pressure) and in kgf/cm^2 (gauge pressure).



P_1 = Primary pressure

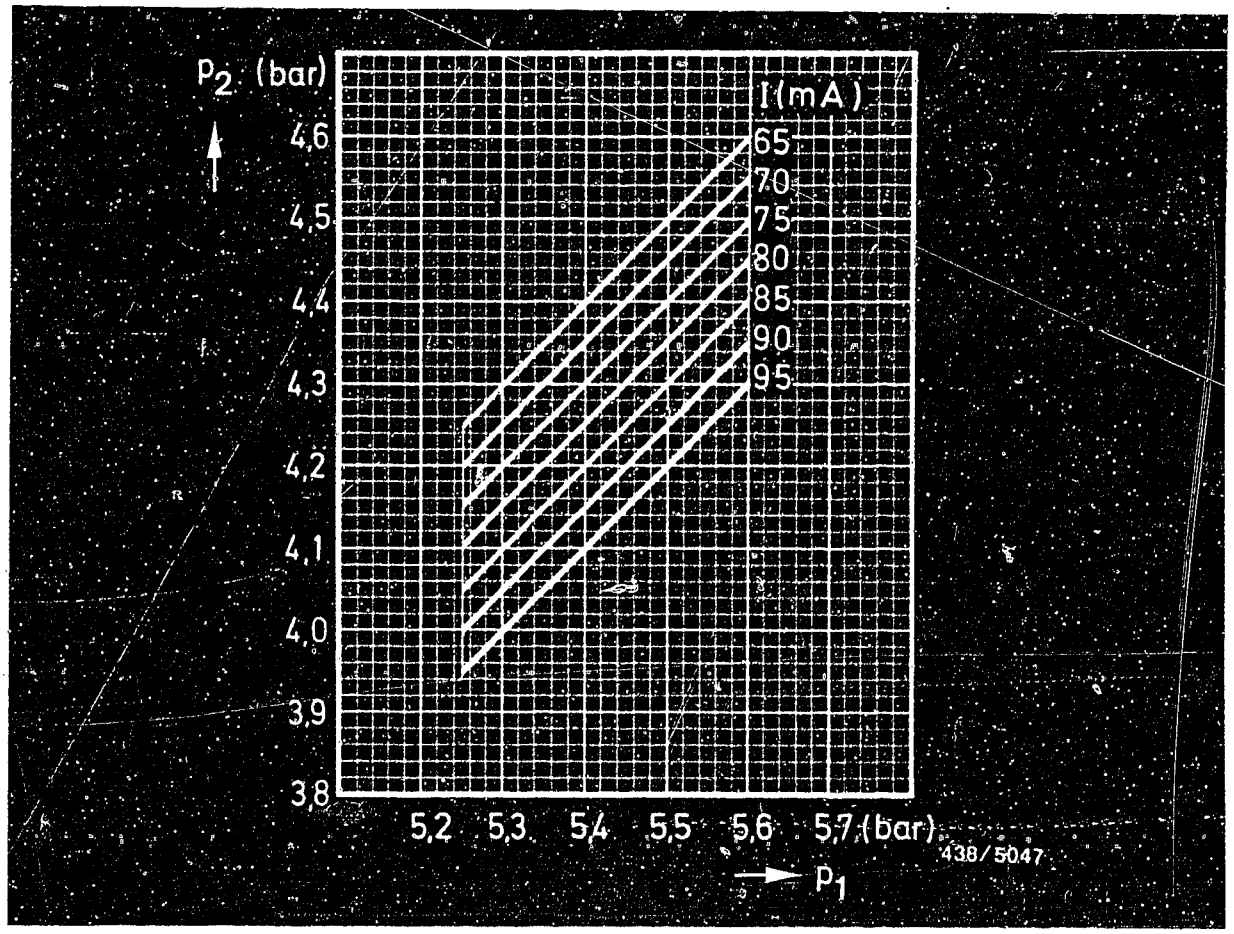
P_2 = Lower-chamber pressure, actuator current = 0 mA

Differential pressure:

(Primary pressure / lower chamber pressure)

Take the test specification for "warm" lower chamber pressure from the graph according to the primary pressure measured.

The "warm" state is simulated by disconnecting the plug from the pressure actuator (actuator current 0 mA).



P_1 = Primary pressure

P_2 = Lower chamber pressure "cold"
Tolerance ± 0.15 bar

I = Actuator current

Take test specification for "cold" lower chamber pressure from graph according to primary pressure measured and according to actuator current measured.

The "cold" state is simulated by disconnecting the plug from the temperature sensor (NTC).

Connect plug to pressure actuator.

Test step	Test specifications *

2.3 Leak test on overall fuel system

Minimum pressure after 10 minutes: after 20 minutes:	 2.7 bar (2.8 kgf/cm²) 2.6 bar (2.7 kgf/cm²)

2.4 Injection valves

Opening pressure	3.0 ... 4.1 bar (3.1...4.2 kgf/cm²)

2.5 Fuel distributor test

(Test with pressure actuator mounted.
Pressure actuator at zero current)

Comparative measurement of deliveries from outlets:	Setting point	Max. allowable delivery
Idle	6.0 cm³/min.	6.6 cm³/min.
Part load	40.0 cm³/min.	42.5 cm³/min.
Full load	100.0 cm³/min.	109.0 cm³/min.

Full-load delivery with maximum deflection of air-flow sensor plate, measured with measuring glass at outlet with the lowest delivery at full-load measuring point: min. 140 cm³/min.

Flow rate of KE throttle in fuel distributor:	130...145 cm³/min.

* Pressures in the test specifications are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

Test step	Test specifications
2.6 Temperature sensor	
Resistance measurements:	
Engine cold Ambient temperature (+ 15° C...+ 30° C):	1300 ... 3600 Ω
Engine at normal operating temperature (approx. + 80° C):	250 ... 390 Ω
2.7 Air-flow sensor potentiometer	
Voltage signal with sensor plate in basic position:	0.2 ... 0.3 V
2.8 Idle-mixture-adjusting screw - basic setting dimension	
(Fuel distributor support - needle bearing):	21.1 ... 21.3 mm

2.9 Idle adjustment *

Idle speed (closed-loop controlled): 700 ... 800 min^{-1}

whereby on/off ratio to be set: 27 ... 29 %

Idle exhaust-gas value (CO): 0.5 ... 1.5 vol. %

* Note on idle adjustment:

In addition to the usual test equipment, the following is required:

- On/off ratio tester: e.g. Bosch lambda closed-loop tester KDJE-P 600 or Bosch pocket motortester KTE 001.03
- Bosch universal test adapter ETT 018.01 with KE-Jetronic test lead 1 684 463 135.

Connection of KDJE-P 600: directly to B+ and ground, blue test lead to red "V" socket of adapter.
Press button "IR" on tester.

Connection of pocket tester: yellow B+. Green to red "V" socket of adapter. Switch position: "100 % ".

To measure the on/off ratio, turn "V" switch on adapter to position 10.

The idle speed is automatically regulated by the idle speed control, but the on/off ratio at idle speed must be checked and, if necessary, corrected by adjusting the bypass screw on the idle actuator.

CO adjustment as usual by adjusting the idle-mixture-adjusting screw in the mixture-control unit.

3. Rapid diagnosis chart for universal test adapter ETT 018.01 with KE-Jetronic test lead 1 684 463 135 and suitable multimeter

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electrical/electronic peripheral and control-unit functions of the KE-Jetronic.

Important notes on the following rapid diagnosis chart:

The "Test conditions" column shows for which test steps the control-unit plug must be connected or disconnected. Make absolutely sure that the ignition is off whenever connecting or disconnecting the control-unit plug.

The "Test connections" column provides information on the leads connected into the respective test circuit, referenced to the pin assignment in the control-unit plug.
Trouble-shooting, if necessary, refers to these leads.

Rapid diagnosis chart for universal test adapter ETT 018.01

Test step	Switch setting V	Switch setting Ω	Button	Object under test	Test connections	Test conditions	Test specifications (Reading)
1	↓	4	-	Pressure actuator internal resistance	12 - 10	Disconnect control-unit plug	21 ... 30 Ω
2	↓	5	-	Temperature sensor internal resistance + 15° ... + 30° C: approx. + 80° C:	21 - 2	Control-unit disconnected	1.3 ... 3.6 kΩ 250 ... 390 Ω
3	↓	11	-	Control unit output stage ground	20 - 2	Control-unit plug disconnected	0 ... 10 Ω
4	3	-	-	Starting signal from terminal 50 of ignition lock (with automatic transmission only)	16 - 2	Control-unit plug disconnected. Select drive mode. Briefly operate starting motor:	8 ... 15 V
5	4	-	-	Starting signal Terminal 50 of starting motor	24 - 2	Control-unit plug disconnected Briefly operate starting motor:	8 ... 15 V
6	5	-	-	TD signal (ignition)	25 - 2	Control-unit plug disconnected Operate starting motor for a few seconds:	Voltage value undefined
7	6	-	-	Control unit power supply	1 - 2	Control-unit plug disconnected. Switch on ignition:	8 ... 15 V

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

Test step	Switch setting V	Switch setting Ω	Button	Object under test	Test connections	Test conditions	Test specifications (Reading)
8	7	-	-	Power supply to potentiometer on air-flow sensor	18 - 2	Connect control unit. Switch on ignition:	7 ... 8 V
9	8	-	-	Potentiometer signal on air-flow sensor	17 - 2	Control unit connected. Switch on ignition. Deflect air-flow sensor plate by hand, whereby voltage rise to max. 8 V	0 ... 8 V
10	10	-	-	Idle actuator power supply and continuity of winding 1	3 - 2	Switch off ignition. Disconnect control-unit plug. Switch on ignition.	8 ... 15 V
11	11	-	-	Idle actuator - continuity of winding 2	4 - 2	Control-unit plug disconnected. Switch on ignition.	8 ... 15 V
12	12	-	-	Air conditioner signal (if applicable)	19 - 2	Control-unit plug disconnected. Switch on ignition. Switch on air conditioner:	8 ... 15 V
13	-	-	1	Warm-up enrichment, 20° C	12 - 12	Current measurement! Connection of measuring equipment: Negative = black socket 1 Positive = black socket 2 Connect control unit. Switch on ignition:	41 ... 62 mA

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

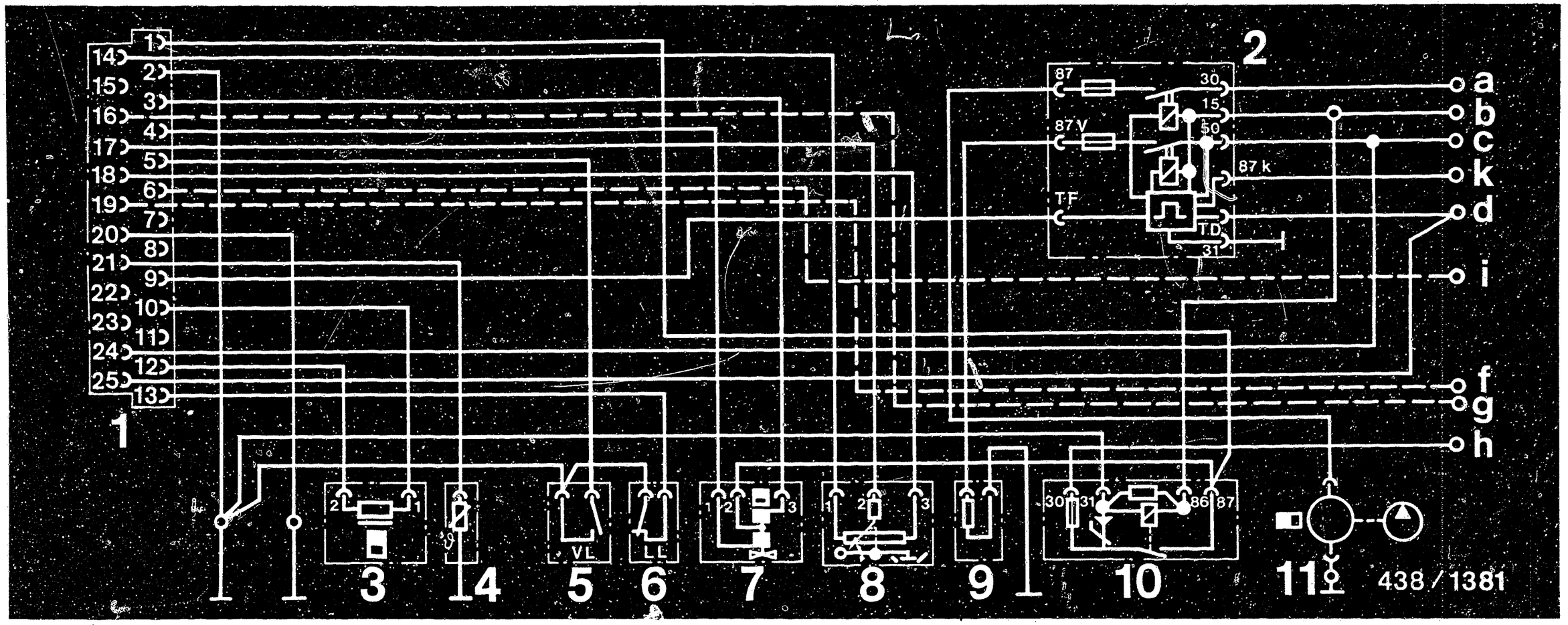
Test step	Switch setting V	Switch setting Ω	Button	Object under test	Test connections	Test conditions	Test specifications (Reading)
14	-	-	2	Actuator current corresponding to engine at normal operating temp.	12 - 12	Control unit connected. Switch on ignition:	0 ... 1 mA
15	-	-	2/4	Starting enrichment	12 - 12	Control unit connected. Switch on ignition. Press button 2 pressed. Then press button 4. Current rises to: Cut-back time:	 120 ... 150 mA approx. 1.5 sec.
16	-	-	1/4	Post-start enrichment	12 - 12	Control unit connected. Switch on ignition. Press button 1 and keep pressed: Press button 4. Current rises to: After a short period, cut-back (approx. 90 s) to:	 41 ... 62 mA 80 ...125 mA 41 ... 62 mA
17	-	-	1/6	Acceleration enrichment	12 - 12	Control unit connected. Switch on ignition. Keep both buttons pressed: Rapidly deflect air-flow sensor plate by hand. Current rises to: Cut-back approx. 1.5 seconds to:	 41 ... 62 mA 130...150 mA 41 ... 62 mA

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

Test step	Switch setting V	Switch setting Ω	Button	Object under test	Test connections	Test conditions	Test specifications (Reading)
18	-	-	2	Overrun cutoff	12 - 12	Control unit connected. Change over terminals of ammeter. (Swap positive and negative; not necessary for measuring instrument with automatic polarity change-over.) Start engine and hold at approx. 2000 min^{-1}. With button 2 pressed, actuate idle throttle-valve switch by hand. Engine hunts. Current reading during the falling engine-speed phases: With cruise control (if applicable) on, there must be no overrun cutoff. In this case, after the cruise control has been switched on, positive (8...15 V) must be applied to pin 6 of the control-unit plug	-40 ... -50 mA
19	-	-	2	Full-load enrichment	12 - 12	Control unit connected. Take apart full-load throttle-valve switch connector and, on the control unit end, jump terminals 2 and 3. Start engine. Press button 2. Current reading at idle speed: Raise engine speed. As of approx. 1000 min^{-1}: As of approx. 1250 min^{-1} to approx. 2100 min^{-1}:	0 ... 1 mA Current rise 5 ... 7 mA

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

Test step	Switch setting V	Switch setting Ω	Button	Object under test	Test connections	Test conditions	Test specifications (Reading)
20	10	-	-	Idle speed control Idle speed control correction functions	3	Test with on/off ratio tester, e.g.: Lambda closed-loop tester KDJE-P 600 or Bosch pocket motortester KTE 001.03 Connection of lambda closed-loop tester: Large clips directly to vehicle battery red +, black -, blue test lead to red "V" socket or test well of adapter. Press button "IR" on tester. Connection of pocket motortester: Yellow clip directly to vehicle battery +, green clip to red "V" socket or test well of adapter. Switch position on tester = "100 % ". Warm up engine and operate at idle speed. Idle speed (closed-loop controlled): whereby on/off ratio: If necessary, adjust on/off ratio (bypass screw on idle actuator) Switch on air conditioner (if applicable): Disconnect idle throttle-valve switch plug: Select drive mode (automatic transmission):	 700 ... 800 min^{-1} 27 ... 29 % 680 ... 780 min^{-1} 720 ... 820 min^{-1} (32...34 %) 640...740 min^{-1} (24 ... 26 %)



4. Electrical terminal diagram with electric fuel pump safety circuit

1 = KE-Jetronic control unit
2 = Electronic relay for energization of electric fuel pump and start valve
3 = Electrohydraulic pressure actuator
4 = Temperature sensor
5 = Double throttle-valve switch
6 = Throttle-valve switch (microswitch on linkage)
7 = Idle actuator
8 = Potentiometer on air-flow sensor
9 = Start valve
10 = Electronics relay with overvoltage protection
11 = Electric fuel pump

a = Terminal 30, single cable connector, B+
b = Terminal 15, central-electrics box, connector U, socket 5
c = Terminal 50, engine cable connector (pin 7)
d = Terminal TD ignition, diagnosis cable connector socket
f = Signal from air conditioner (if applicable)
g = Terminal 50, ignition lock, with automatic transmission or engine ground, with manual transmission
h = Terminal 30, single cable connector, B+
i = Signal from cruise control (if applicable)
k = Kickdown switch, socket 1 (through engine cable connector pin 9)

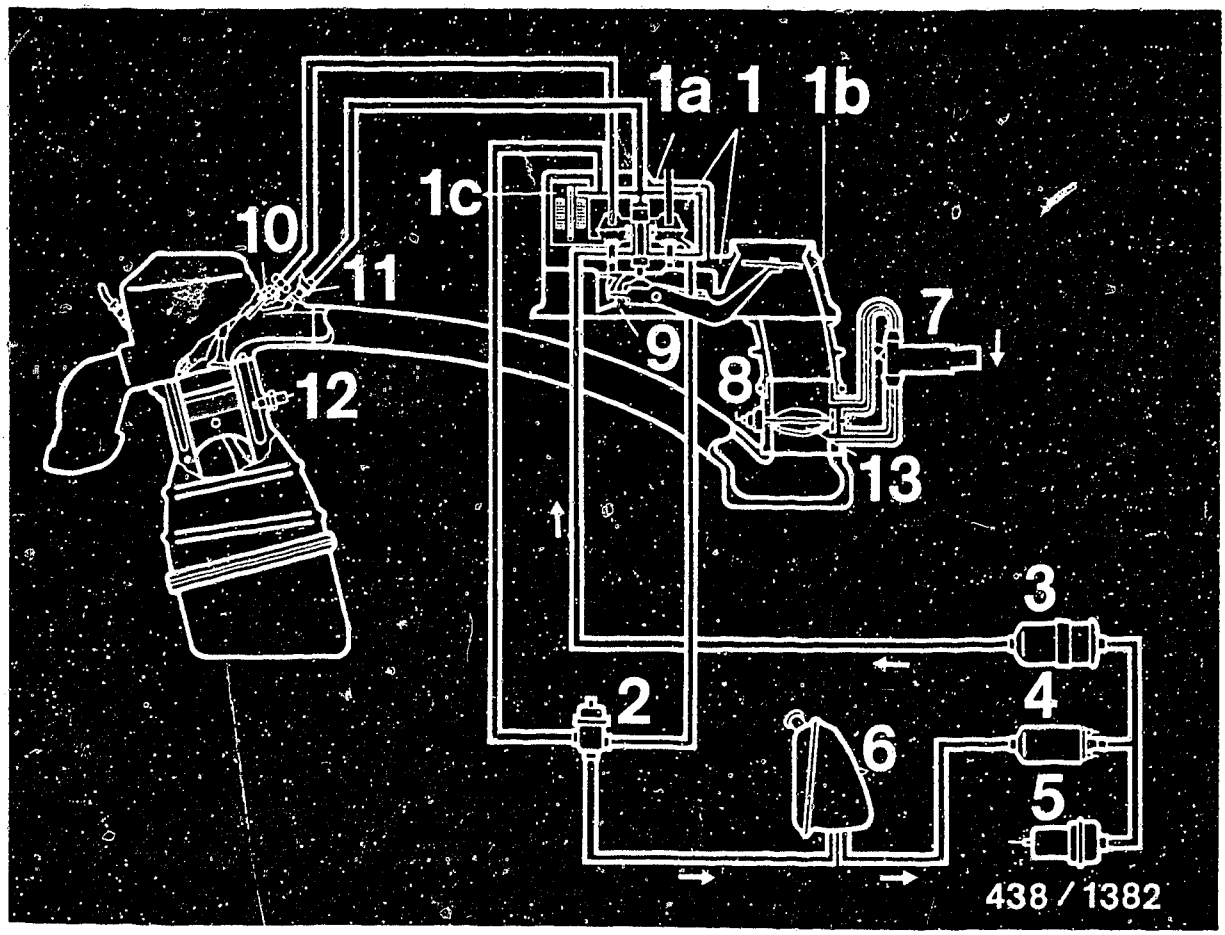
Important:

To test the control unit functions, it is sufficient to switch on the ignition.

In this case, the safety circuit must not be jumped.

This ensures that no fuel is injected when the air-flow sensor plate is moved.

This would lead to serious engine damage when the engine is subsequently started.



5. Diagram of lines - Fuel/air systems

1 = Mixture-control unit
1a = Fuel distributor
1b = Air-flow sensor
1c = Electrohydraulic pressure actuator
2 = Pressure regulator (primary pressure)
3 = Fuel filter
4 = Electric fuel pump
5 = Fuel accumulator
6 = Fuel tank
7 = Idle actuator
8 = Full-load throttle-valve switch (idle switch on linkage)
9 = Air-flow sensor potentiometer
10 = Injection valve
11 = Start valve
12 = Temperature sensor (NTC)
13 = Throttle valve

6. Installation position of components

(Components on engine predominantly the same as in 190 E)

Mixture-control unit:	above intake manifold and throttle-valve assembly
Primary-pressure regulator:	between intake ports 1 and 2
Injection valves:	in the flanges of the intake ports
Electric fuel pump, filter, accumulator:	on bottom of vehicle, on right in front of rear axle, protected by splashplate
Temperature sensor (NTC):	on cylinder head, single round-pin plug
Control unit, overvoltage protection device, engine-speed relay for safety circuit and cold-start control:	in equipment space, on right behind battery, protected by plastic cover
Idle actuator:	between intake ports 3 and 4
Idle/full-load throttle-valve switch:	on throttle-valve assembly, throttle shaft
Idle microswitch:	on throttle linkage, in area in front of mixture-control unit.

TABLE OF CONTENTS

1. SPECIAL FEATURES

These ABS instructions can be used for testing all Mercedes-Benz vehicles of type W 124 (as of 1.85). Further details can be found in the similar, detailed SIS instructions MB 500 (type W 201).

2. TEST SPECIFICATIONS

For reasons of safety, the ABS may only be tested using the ABS tester.
The rapid diagnosis chart contains all important test specifications as well as notes on testing and trouble-shooting.

3. TEST CONDITIONS FOR TESTING WITH ABS TESTER

- The tester must have been converted to the latest technical status (identification "U2" on nameplate or as of FD 352).
- Check ground connections of return pump and overvoltage protection relay term. 31 for security and corrosion.
- Check hydraulic connections and joints on hydraulic modulator for leaks (visual examination).
- If the ABS warning lamp comes on occasionally while driving (e.g. after switching on electrical devices) and goes out again by itself, check battery and power supply (alternator, regulator and voltage drops).
- If the ABS warning lamp is constantly on and does not go out, check the following points:

- Is multiple plug correctly seated on control unit and is it latched in?
  All plug contacts O.K.?
  Spring contacts latched?
- V-belt broken? (Alternator not supplying any voltage, charge indicator and ABS warning lamps on)
- Voltage from alternator terminal 61?
  Plug-in connector and lead to ABS control unit O.K.?
- Check for loose contacts at wheel-speed sensors with program switch in position 10.

- For testing with the tester, switch on the ignition for all program switch positions (tester works on power supply from vehicle battery).
- Watch lamps 1 and 2 of tester for all program switch positions.

Caution:

Do not drive with the tester connected.
Whenever repairs have been carried out, repeat the entire test program.

General information on trouble-shooting

Check all leads for short circuit to ground and contact with positive leads, and also watch for worn spots and pinching.

- Connect ABS tester to control unit and ABS wiring harness.

Caution:

Disconnect and connect the control unit only with the ignition off.
The control unit is installed in the equipment space behind the battery.
Do not mix up with KE-Jetronic control unit, where applicable.

- Using ohmmeter, check unidirectional-breakdown diode in overvoltage protection relay in forward and reverse directions between terminals 30 and 31.
  (Substitute test for test step 5).

4. RAPID DIAGNOSIS CHART FOR ABS TESTER

Switch on ignition for all program switch positions.

Program switch position	Testing of	additional operation	Test specifications (Reading)	Cause of trouble
1 ... 24	Power supply for each test step	-----	Lamp 1 (green) must be lit for each test step.	• Battery insufficiently charged. Repeat test step with engine running. • High voltage drops at terminals (e.g. ground terminal). • Open circuit in ground connection
1	Valve relay off-position	-----	Lamp 1 (green) and lamp 3 (green) must be lit.	• Open circuit or high contact resistance in leads (including ground lead) to valve relay. • Valve relay defective.
2	Valve relay operation	-----	Lamp 1 (green) and lamp 3 (green) must be lit.	
3	Motor relay off-position	-----	Lamp 1 (green) and lamp 3 (green) must be lit.	• Open circuit or high contact resistance in leads to motor relay. • Motor relay defective. • Check pump motor for continuity.
4	Motor relay operation	Press illuminated key	Lamp 1 (green) and lamp 3 (green) must be lit. Pump motor running.	

Program switch position	Testing of	additional operation	Test specifications (Reading)	Cause of trouble
5	As an alternative, check unidirectional-breakdown diode in overvoltage protection relay in forward and reverse directions with ohmmeter.			
6	Internal resistances of solenoid-operated valves in hydraulic modulator	Switch off ignition. Re-connect control unit. Switch on ignition. Press key FL Press key FR Press key RA	Lamp 1 (green) must be lit. FL: 0.7 ... 1.7 Ω FR: 0.7 ... 1.7 Ω RA: 0.7 ... 1.7 Ω	• Open circuit or high contact resistance in leads to the respective valve. • Hydraulic modulator defective.
7	Ground connection to term. 10	Press illuminated key	Lamp 1 (green) must be lit. 80 ... 300 mV	• Open circuit or high contact resistance in ground lead or ground terminal.
8	Ground connection to term. 34	Press illuminated key	Lamp 1 (green) must be lit. 10 ... 250 mV	
9	Ground connection to term. 20	Press illuminated key	Lamp 1 (green) must be lit. 10 ... 250 mV	

Program switch position	Testing of	additional operation	Test specifications (Reading)	Cause of trouble
10	Internal resistances of wheel-speed sensors	Press key FL Press key FR Press key RA	Lamp 1 (green) must be constantly lit. FL : 0.9 ... 2.3 kΩ FR : 0.9 ... 2.3 kΩ RA : 0.6 ... 1.6 kΩ Modular wheel-speed sensors as of approx. 4.85: FL : 0.6 ... 1.6 kΩ FR : 0.6 ... 1.6 kΩ	• Check for loose contacts: Move all leads at fastening points, at plug and at wheel-speed sensor, and watch reading. • Open circuit or high contact resistance in leads to the respective wheel-speed sensor. • Respective wheel-speed sensor defective.
11	Insulation resistances of wheel-speed sensors	Press key FL Press key FR Press key RA	Lamp 1 (green) must be constantly lit. FL : 20 ... 999 kΩ FR : 20 ... 999 kΩ RA : 20 ... 999 kΩ	• Check for insulation damage in leads to the respective wheel-speed sensor. • Respective wheel-speed sensor defective.
12	DC voltage on wheel-speed sensor leads	Press key FL Press key FR Press key RA	Lamp 1 (green) must be constantly lit. FL : 000 ... 100 mV FR : 000 ... 100 mV RA : 000 ... 100 mV	• Check leads to the respective wheel-speed sensor for contact (worn spot) with a positive lead. • Respective wheel-speed sensor defective.
13	Internal control unit supply voltage	Press illuminated key	4.75 ... 5.25 V	• Control unit defective

Program switch position	Testing of	additional operation	Test specifications (Reading)	Cause of trouble
14	Diode in forward direction and ABS warning lamp		0.4 ... 1.5 V ABS warning lamp in vehicle must be lit	• Open circuit or contact resistance in leads to diode and/or warning lamp. • Warning lamp defective. • Diode (hydraulic modulator) defective.
15	Diode in reverse direction		1.5 ... 8.5 V ABS warning lamp slightly dimmer.	• Diode (hydraulic modulator) defective.
16	Control unit BITE* triggering	Press illuminated key for 3 seconds	Warning lamp must go out after max. 1 second	• Control unit defective.
17	Control unit, BITE* fault simulation	Press illuminated key for 3 seconds	Warning lamp must still be lit (flickering allowable).	• Control unit defective.
18	Control unit, current for pressure holding	Press key FL, press illuminated key, press key FR, press illuminated key, press key RA press illuminated key.	FL : 1.9 ... 2.3 A FR : 1.9 ... 2.3 A RA : 1.9 ... 2.3 A	• Control unit defective.
19	Control unit, current for pressure reduction	Press key FL, press illuminated key, press key FR, press illuminated key, press key RA press illuminated key.	FL : 4.5 ... 6.0 A FR : 4.5 ... 6.0 A RA : 4.5 ... 6.0 A	• Control unit defective
24	Voltage from stop-lamp switch	Press brake pedal	10 ... 15 V	• Lead to stop-lamp switch defective. • Stop-lamp switch defective. • Stop lamps defective.

* BITE = Built-in test equipment

A brake analyzer is required for program switch positions 20, 21, 22, and 23. Do not drive with the tester connected.
Do not use a brake-pedal actuating device for setting the braking force. Program switch position 23 must come first.
Front axle
Drive front wheels of vehicle onto brake analyzer. Pull on handbrake.

Program switch position	Testing of	additional operation	Test specifications (Reading)	Cause of trouble
23	Wheel-speed sensor signal and identity check	Press key FL, switch on left-hand brake roller.	FL : 1.9 ... 19	• Wheel-speed sensors mixed up? • Air gap too great. • Respective wheel-speed sensor defective.
		Press key FR, switch off left-hand brake roller, switch on right-hand brake roller.	FR : 1.9 ... 19	
20	Hydraulic modulator pressure reduction and identity check	Press key FR. Switch on right-hand brake roller. Press brake pedal and hold constant at 2000 N. Press illuminated key.	FR : less than 1100N	• End reading may change by max. 200 N in 3 sec. • Brake lines mixed up? • Conventional braking system O.K.? • Hydraulic modulator defective. Note: Replace hydraulic modulator only as a complete unit. Repairing is not allowed. Danger!
		Press key FL. Switch off right-hand brake roller. Switch on left-hand brake roller. Press brake pedal and hold constant at 2000 N. Press illuminated key.	FL : less than 1100N	
21	Hydraulic modulator pressure buildup	Press key FL. Switch on both brake rollers. Press brake pedal and hold constant at 2000 N. Allowable difference between both wheels max. 500 N. Press illuminated key.	Left-hand brake analyzer reading moves to an intermediate value and rises again to FL: 800 ... 1700 N	

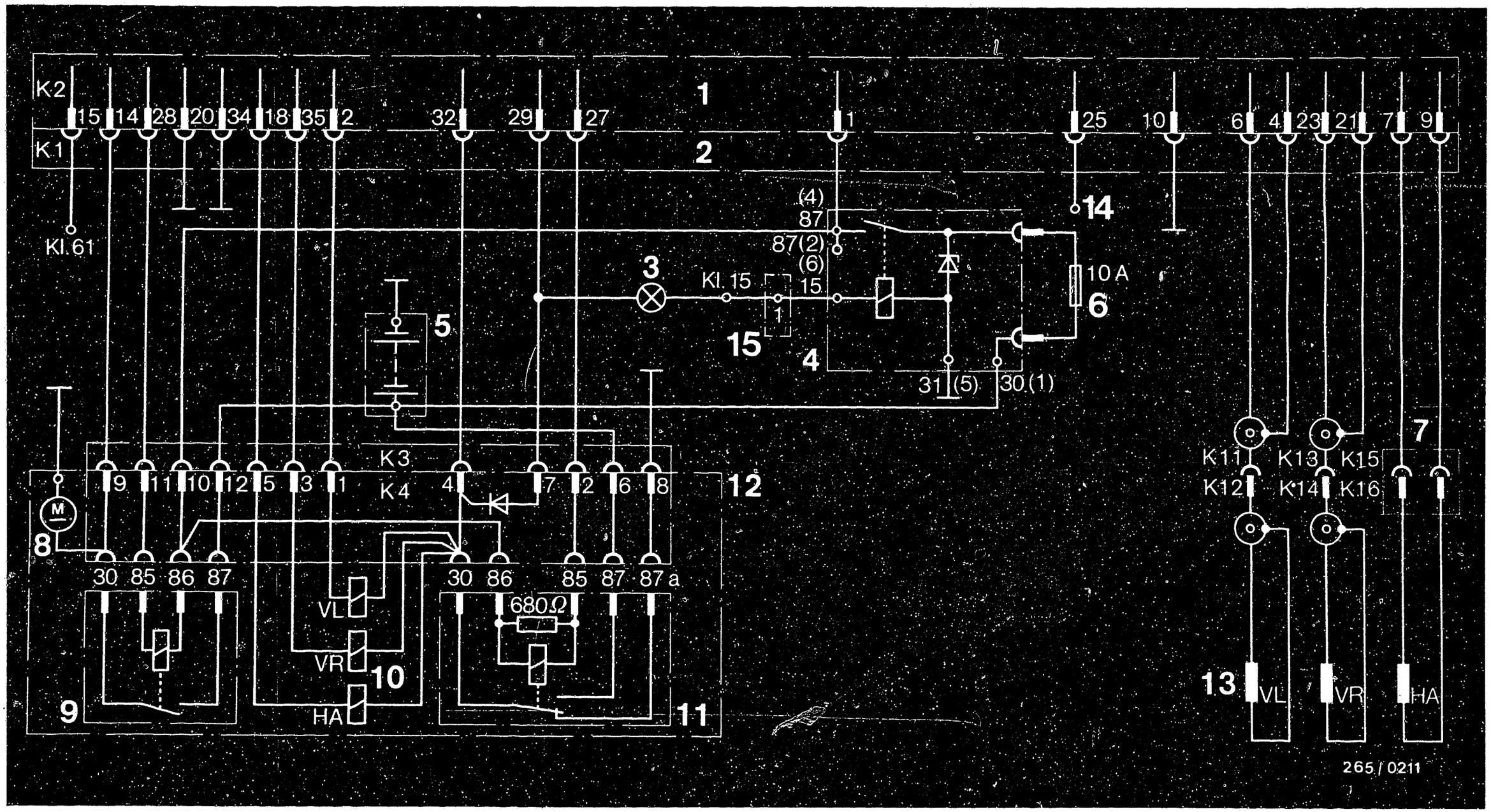
Program switch position	Testing of	additional operation	Test specifications (Reading)	Cause of trouble
21	Hydraulic modulator pressure buildup	Press key FR. Switch on both brake rollers. Press brake pedal and hold constant at 2000 N. Press illuminated key	Right-hand brake analyzer reading moves to an intermediate value and rises again to FR : 800 ... 1700 N	• Brake lines mixed up? • Conventional braking system O.K.? • Hydraulic modulator defective. Note: Replace hydraulic modulator only as a complete unit. Repairing is not allowed. Danger!
22	Hydraulic modulator pump delivery	Switch on brake rollers. Read off inherent friction value. Press key FA. Press brake pedal and hold constant at 2000 N. Press illuminated key.	After an intermediate value on both sides, return pump switches on briefly. Reading on both sides must drop below inherent friction value plus max. 200 N. Press illuminated key until reading rises again to 2000 N.	• Hydraulic modulator defective. Note: Replace hydraulic modulator only as a complete unit. Repairing is not allowed. Danger!

Rear axle:	Drive rear wheels of vehicle onto brake analyzer.			
23	Wheel-speed sensor signal	Press key RA, switch on both brake rollers	RA : 1.9 ... 19	• Wheel-speed sensors mixed up? • Air gap too great. • Respective wheel-speed sensor defective.

Program switch position	Testing of	additional operation	Test specifications (Reading)	Cause of trouble
20	Hydraulic modulator Pressure reduction	Press key RA. Switch on both brake rollers. Press brake pedal and hold constant at 2000 N. Allowable difference between both wheels max. 500 N. Press illuminated key.	RA: less than 1100 N	• Brake lines mixed up? • Conventional braking system O.K.? • Hydraulic modulator defective. Note: Replace hydraulic modulator only as a complete unit. Repairing not allowed. Danger!
21	Hydraulic modulator Pressure buildup	Press key RA, switch on both brake rollers. Press brake pedal and hold constant at 2000 N. Press illuminated key.	Brake analyzer readings on both sides move to an intermediate value and rise again to RA : 600 ... 1700 N	
22	Hydraulic modulator Pump delivery	Switch on brake rollers. Read off inherent friction value. Press key RA. Press brake pedal and hold constant at 2000 N.	After an intermediate value on both sides, return pump switches on briefly. Readings on both sides must drop below inherent friction value plus max. 200 N.	• Hydraulic modulator defective. Note: Replace hydraulic modulator only as a complete unit. Repairing not allowed. Danger!

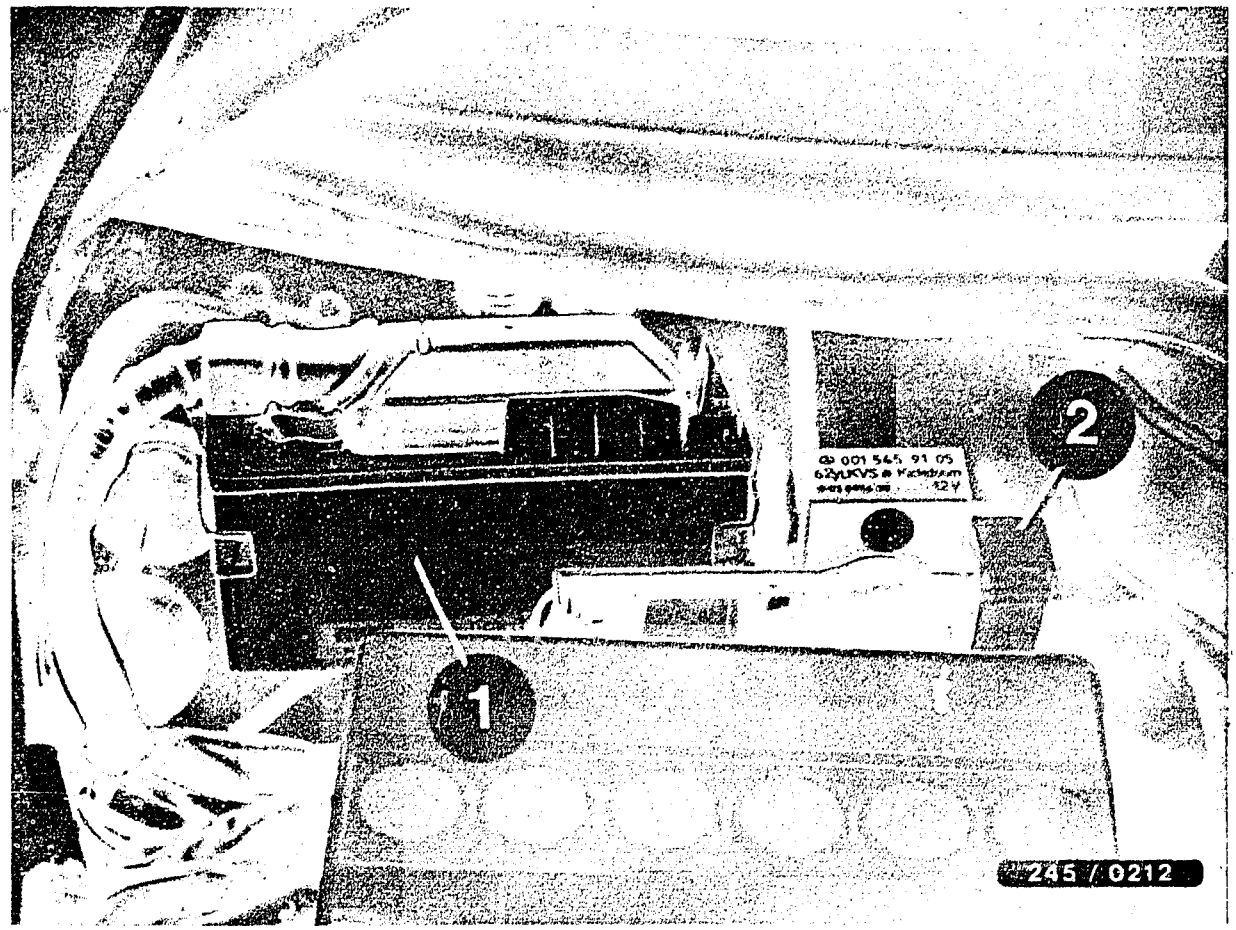
Finally, conduct a road test.

With the engine running, the indicator lamp must go out.
Drive at at least 30 km/h.
The indicator lamp must not come on again.



1 = Electronic control unit
2 = Multiple plug (35-pin)
3 = ABS warning lamp
4 = Overvoltage protection relay
5 = Battery
6 = Plug-in fuse
7 = Cable connector
8 = Return pump motor
9 = Motor relay
10 = Solenoid-op. valves
11 = Valve relay
12 = Hydraulic modulator
13 = Wheel-speed sensor
14 = To stop-lamp switch (+)
15 = Plug connector 12-pin
VL = FL (front left)
VR = FR (front right)
HA = RA (rear axle)
K 1 to K 16 = ABS plug connectors

5. ELECTRICAL TERMINAL DIAGRAM



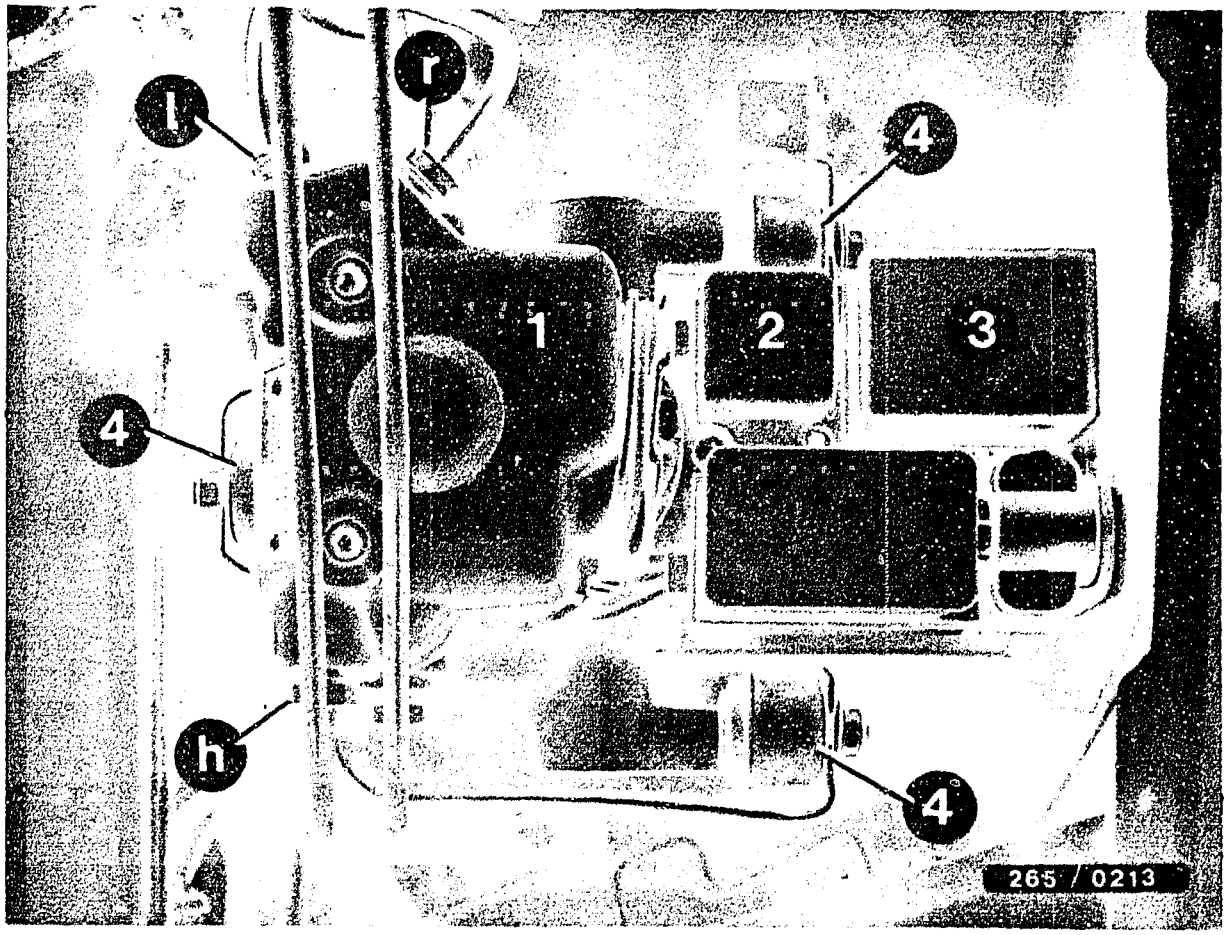
1 = ABS control unit

2 = Overvoltage protection relay

6. INSTALLATION POSITION OF COMPONENTS

The indications "right" and "left" apply always as viewed in the forward direction of travel.

- Control unit:
  In equipment space on right, behind battery.
- Overvoltage protection relay:
  In equipment space on right, near control unit.
- ABS warning lamp:
  In instrument panel



1 = Hydraulic modulator
2 = Valve relay
3 = Motor relay
4 = Mountings

- Front-axle wheel-speed sensors:
  One each on left and right in steering knuckles.

- Rear-axle wheel-speed sensor:
  Only 1 wheel-speed sensor on rear axle housing.

- Hydraulic modulator:
  In engine compartment at front left.

- ABS ground terminal:
  Behind instrument cluster, bottom left, near plug connections of central-electrics box.

7. TEST EQUIPMENT AND TOOLS

Description	Designation	Part No.
ABS tester Use only converted tester. Identification "U2" on nameplate or as of FD 352	ETT 016.00	0 684 101 600
Brake analyzer	e.g. BPS 100 or BPS 101 or BPS 104 or BPS 105	0 680 012 .. 0 680 013 .. 0 680 018 .. 0 680 019 ..
Filling and discharging device		e.g. ATE Part No. 3.9302-1000.4 [1]
Bleeder fitting For connection of filling and discharging device to master cylinder fluid reservoir		ATE Part No. 3.9302.0702.2 [1]
Bleeder hose		ATE Part No. 3.3590.2300.1 [1]
Auxiliary hose		ATE Part No. 3.9302.0704.2 [1]
Brake pedal actuating device		ATE Part No. 3.9312.0100.4 [1]

1) = obtainable from Alfred Teves GmbH, Guerickestraße7
6000 Frankfurt (Main)

Description	Designation	Part No.
Pressure tester Tester for low- and high-pressure testing of hydraulic brake systems		e.g. ATE Part No. 3.9305-0200.4 1)
Double-end box wrench open 9 x 11 mm		Hazet Part No. 612 2)
Vessel for collecting the brake fluid approx. 1 l		
Brake fluid	Use only ATE genuine brake fluid DOT 4 or Mercedes-Benz brake fluid.	
Electrics tester or Multimeter for trouble-shooting	ETE 014.00	0 684 101 400 commercially available

1) = obtainable from: Alfred Teves GmbH
Guerickestr. 7
6000 Frankfurt (Main)

2) Firma Hazet
5630 Remscheid

7.1 Additional equipment

Use only Daimler Benz genuine brake lines.

Description	Part No.
Grease for wheel-speed sensors	Molykote Longterm 2
Protective caps for brake lines	Bosch Part No. 1 900 508 002 (100 pieces)
Protective caps for brake line connections on hydraulic modulator	1 900 508 004 (100 pieces)

Table of contents

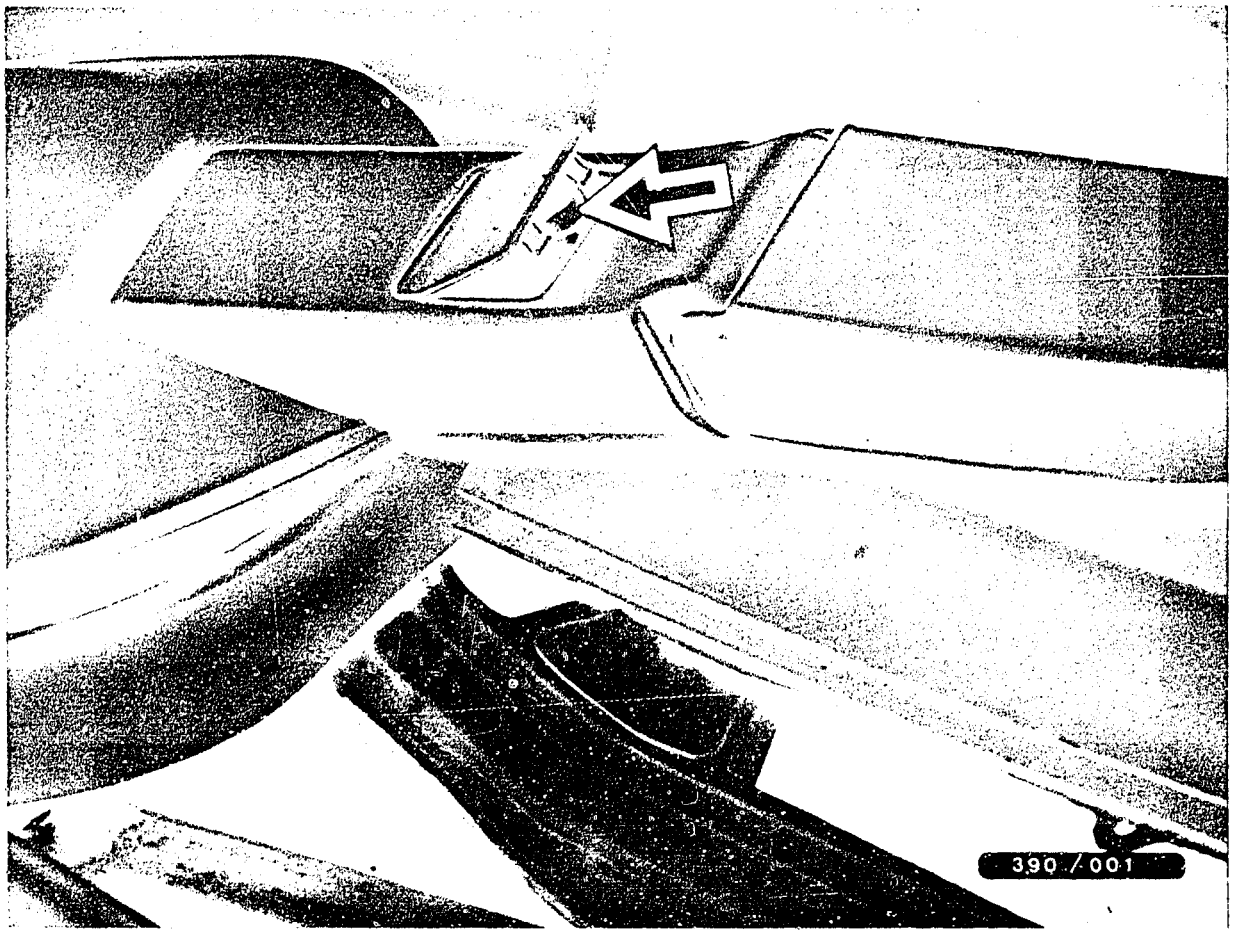
1. Special features

The controlled single-arm wiper system is installed in the following vehicles:

Type W 201:	190, 190 E, 190 D	as of 1.1985
Type W 124:	200, 230 E, 260 E, 300 E	
	200 D, 250 D, 300 D	as of 1.1985

2. General information

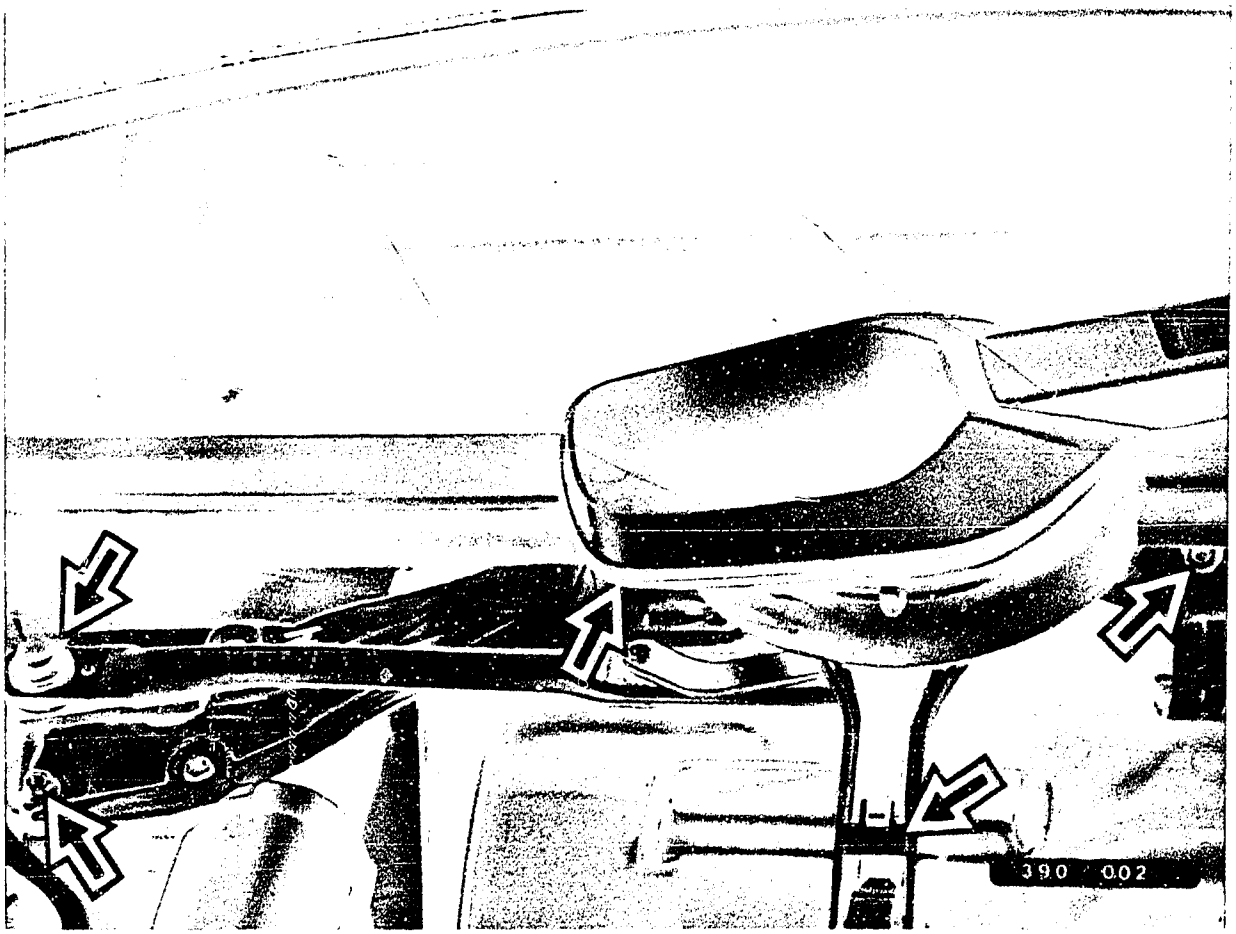
Remove the ignition key when working on the wiper system. As of ignition-key position "1", the automatic parking-position function may be energized by movements on the wiper arm or the wiper linkage. This might lead to hand injuries.



3. Removing the wiper system

Open mounting flap on wiper arm and unscrew clamping screw (see picture, arrow).
Remove wiper arm.

Note:
In winter, it is possible for snow to be pressed under the wiper arm. To prevent damage, there is provision for the mounting flap to be pressed open by the snow.



Remove cover at air inlet (already removed in picture). Loosen fastening screws and holding clamp (picture, arrows), disconnect plug connector for electrical connection and remove wiper system.

Note: Picture shows wiper system for Type W 124.

4. Repairing the wiper system

The following exchange assemblies have been specified for the wiper drive:
(Board with reciprocating-gear drive)

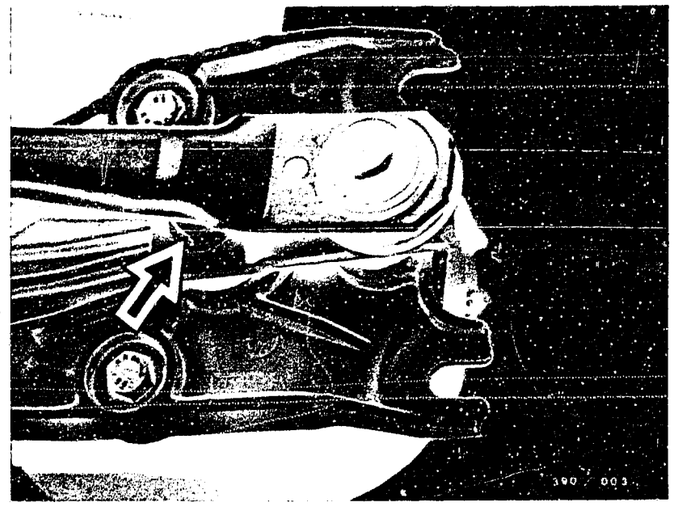
Type W 201	(LHD)	3 398 009 241
	(RHD)	3 398 009 242
Type W 124	(RHD + LHD)	3 398 009 240
	(with air conditioner)	3 398 009 245

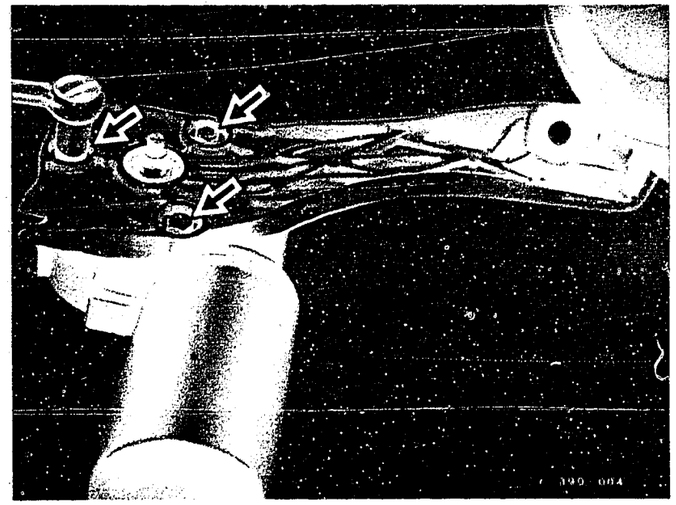
Further repair assemblies are not planned.

Note: Service parts and exchange assemblies are not compatible with SWF systems.

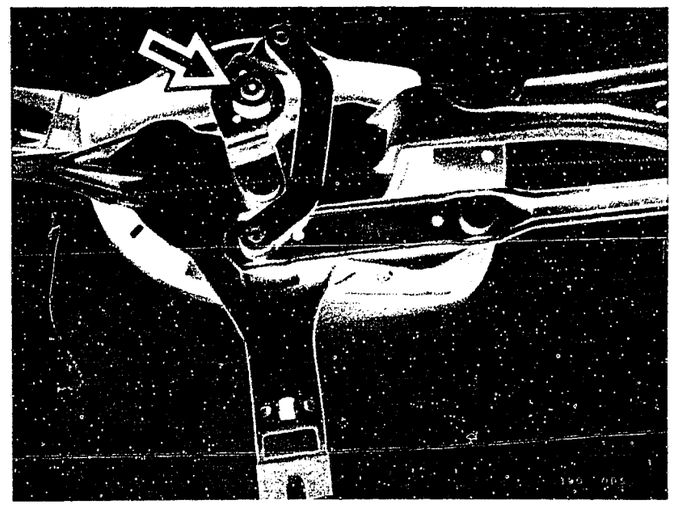
4.1 Dismantling the wiper drive

Loosen fastening nut (top picture, arrow) from wiper-motor shaft and remove. Remove crank.
Unscrew wiper-motor fastening screws (center picture, arrows) and remove wiper motor.
Check sliding-crank drive for freedom of movement.





Unscrew cross-link drive fastening nut (bottom picture, arrow) from cross-link drive shaft and force off cross-link drive with linkage.



4.2 Replacing the cover of the sliding-crank drive

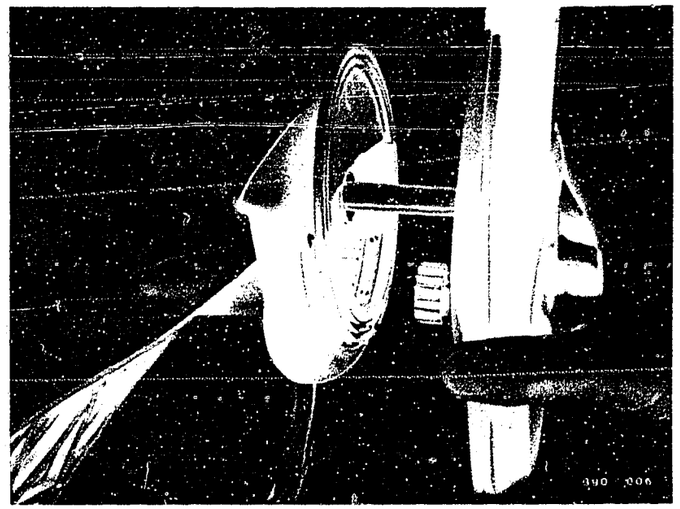
Remove retainer and shims from sliding-crank drive.
Remove complete sliding-crank drive from mounting.
To do this, the sliding-crank drive must be in the center position. Angle between sliding rod and board approx. 90° (see top picture). Sliding rod must be at bottom dead center.

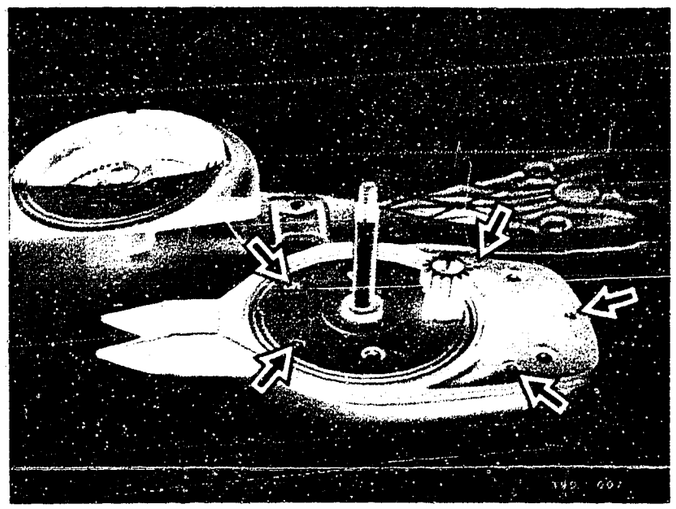
Unscrew drive-cover fastening screws (bottom picture, arrows) and remove drive cover.

Put on new drive cover and screw down, ensuring correct seating of seal between sliding-crank drive and drive cover. Tightening torque for fastening screws: 0.8 Nm.

Insert sliding-crank drive into board (see top picture).

Re-mount O-ring and shims in correct order; insert retainer.





5. Assembling the wiper drive – Type W 124 LHD

Insert wiper motor into board and tighten fastening screws.
Put crank on wiper-motor shaft and align to 4 mm gap between crank and edge of mounting eye (see top picture).

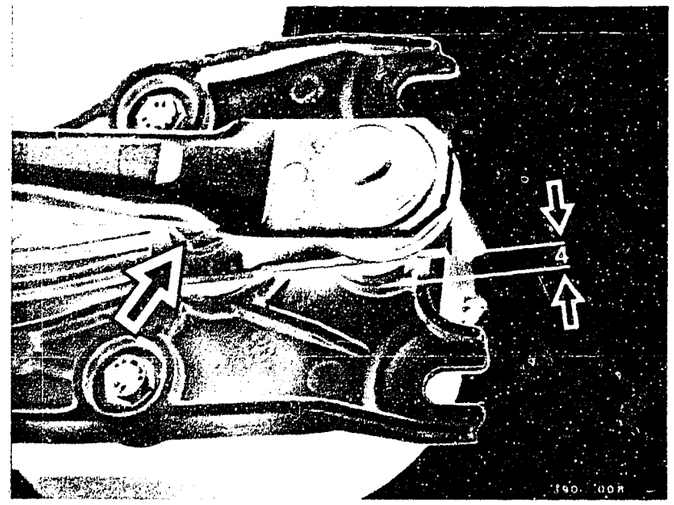
Note: Wiper motor must be in parking position. If necessary, connect cable set and allow wiper motor to run into parking position.

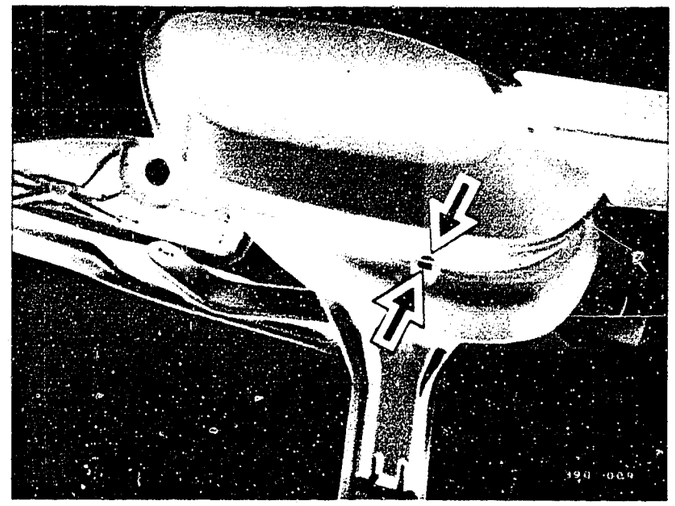
Put on fastening nut for crank (see top picture, arrow) and tighten to 19 Nm.

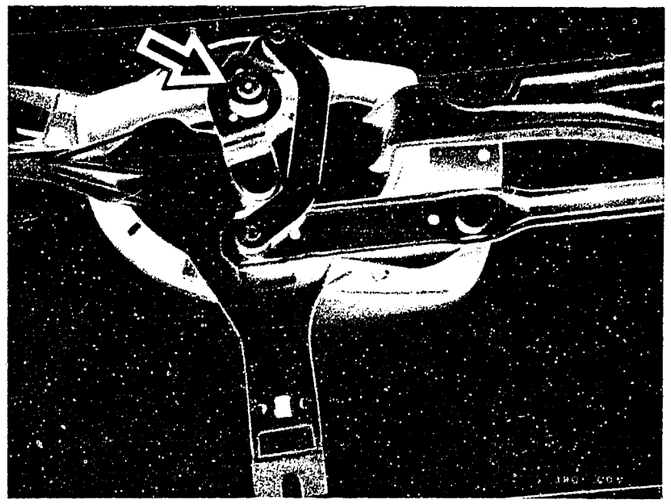
Align sliding-crank drive so that the marks (see center picture, arrows) are in alignment (parking position, wiper arm pointing toward driver side).

Note: In older drive assemblies without marks on sliding-crank drive, the sliding rod must be at bottom dead center.

Put cross-link drive onto shaft of sliding-crank drive and tighten fastening nut (bottom picture, arrow) to 29 Nm.







5.1 Installing the wiper system

Note: When installing the wiper drive, ensure correct seating of seal between wiper drive, windshield and body.

Mount wiper arm.

Note: Before mounting the wiper arm, lubricate sliding rod lightly with 5 964 520 125 (VS 14060 Ft).

6. Assembling the wiper drive – Type W 124 RHD

Insert wiper motor into board and tighten fastening screws.
Put crank on wiper-motor shaft and align to 4 mm gap between crank and edge of mounting eye (see top picture).

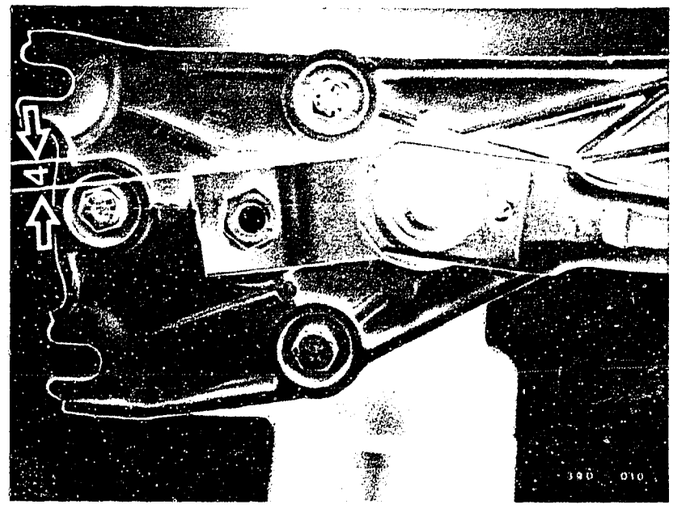
Note: Wiper motor must be in parking position. If necessary, connect cable set and allow wiper motor to run into parking position.

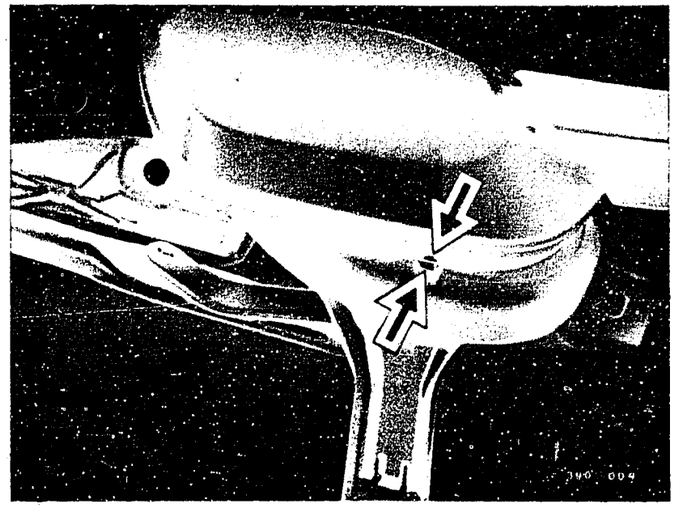
Put on fastening nut for crank and tighten to 19 Nm.

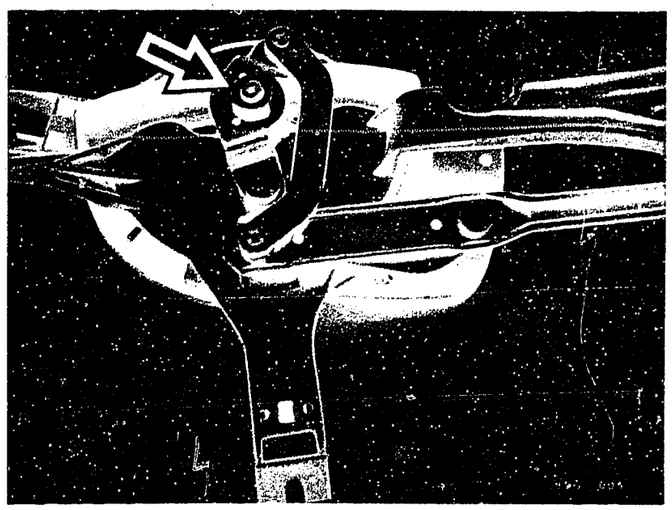
Align sliding-crank drive so that the marks (see center picture, arrows) are in alignment (parking position, wiper arm pointing toward driver side).

Note: In older drive assemblies without marks the sliding rod must be at bottom dead center.

Put cross-link drive onto shaft of sliding-crank drive and tighten fastening nut (bottom picture, arrow) to 29 Nm.







6.1 Installing the wiper system

Note: When installing the wiper drive, ensure correct seating of seal between wiper drive, windshield and body.

Mount wiper arm.

Note: Before mounting the wiper arm, lubricate sliding rod lightly with 5 964 520 125 (VS 14060 Ft).

7. Assembling the wiper drive – Type W 201 LHD

Insert wiper motor into board and tighten fastening screws.

Put crank 2 on wiper-motor shaft and align (see top picture). Crank 2 is on edge of recess (arrow), or linkage 1 and crank 2 are parallel.

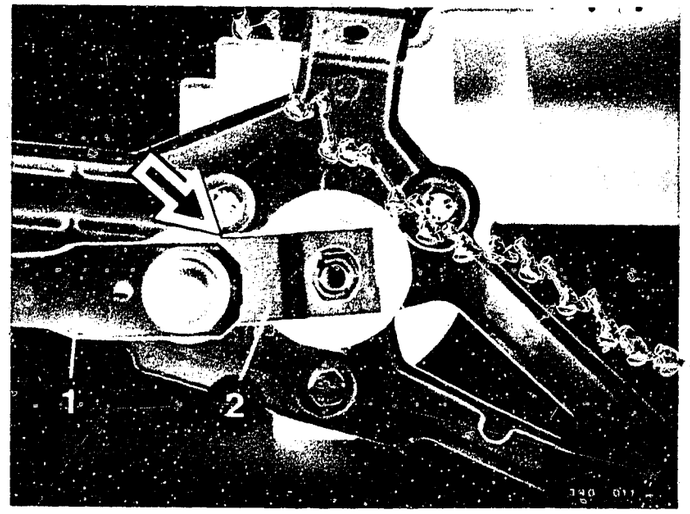
Note: Wiper motor must be in parking position. If necessary, connect cable set and allow wiper motor to run into parking position.

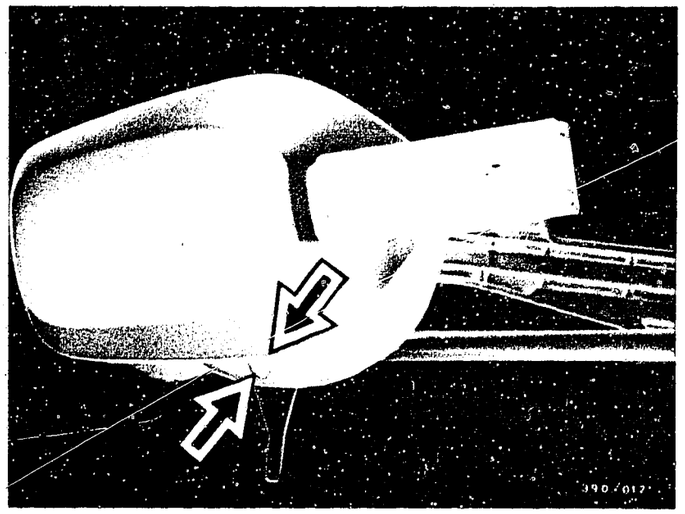
Put on fastening nut for crank and tighten to 19 Nm.

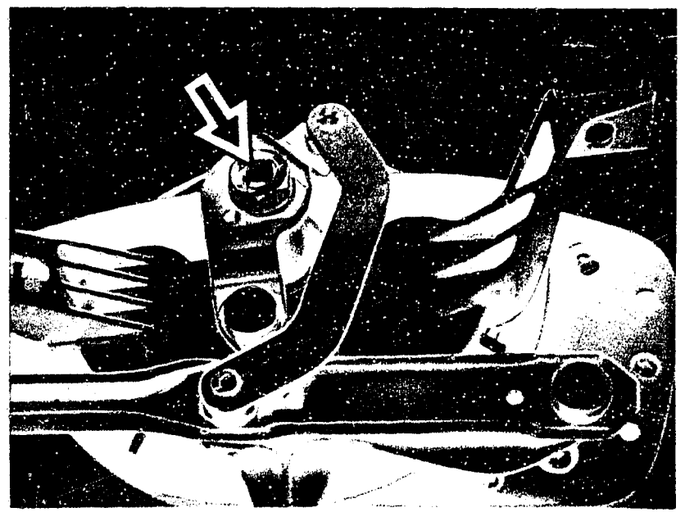
Align sliding-crank drive so that the marks (see center picture, arrows) are in alignment (parking position, wiper arm pointing toward driver side).

Note: In older drive assemblies without marks, the sliding rod must be at bottom dead center.

Put cross-link drive onto shaft of sliding-crank drive and tighten fastening nut (bottom picture, arrow) to 29 Nm.







7.1 Installing the wiper system

Note: When installing the wiper drive, ensure correct seating of seal between wiper drive, windshield and body.

Mount wiper arm.

Note: Before mounting the wiper arm, lubricate sliding rod lightly with 5 964 520 125 (VS 14060 Ft).

8. Assembling the wiper drive – Type W 201 RHD

Insert wiper motor into board and tighten fastening screws.
Put crank 2 on wiper-motor shaft and align (see top picture). Crank 2 is on edge of recess (arrow), or crank 2 and lever 1 are parallel.

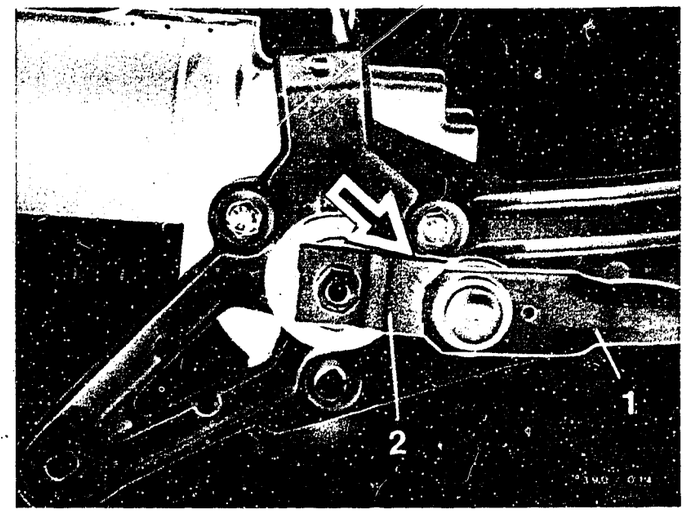
Note: Wiper motor must be in parking position. If necessary, connect cable set and allow wiper motor to run into parking position.

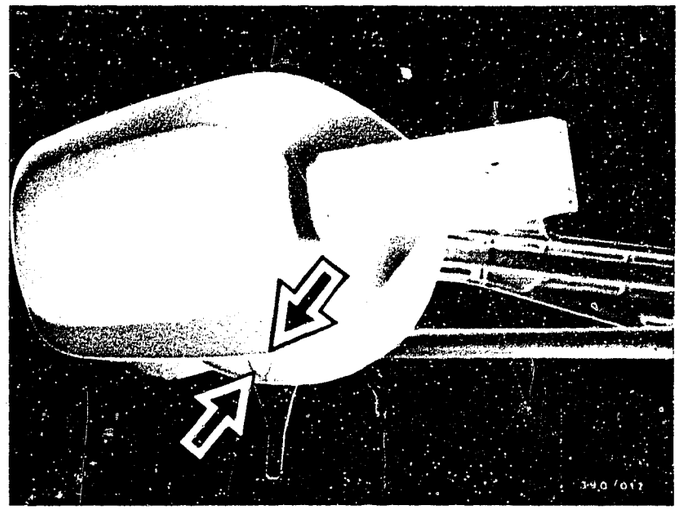
Put on fastening nut for crank and tighten to 19 Nm.

Align sliding-crank drive so that the marks (see center picture, arrows) are in alignment (parking position, wiper arm pointing toward driver side).

Note: In older drive assemblies without marks on sliding-crank drive, the sliding rod must be at bottom dead center.

Put cross-link drive onto shaft of sliding-crank drive and tighten fastening nut (bottom picture, arrow) to 29 Nm.





8.1 Installing the wiper system

Note: When installing the wiper drive, ensure correct seating of seal between wiper drive, windshield and body.

Mount wiper arm.

Note: Before mounting the wiper arm, lubricate sliding rod lightly with 5 964 520 125 (VS 14060 Ft).

TABLE OF CONTENTS

Sections | Coordinates

Special features

- LE2-Jetronic with 25-pin control unit 0 280 000 326/327 triggered by term.1 of ignition coil, 0 280 000 338/339 triggered by term.5 of electronic ignition spark advance unit. 5-pin air flow sensor and 7-pin control relay. Solenoid-operated injection valves with brass-wire coil.
- Start control, i.e. additional injected fuel quantity via all solenoid-operated injection valves.
- Cold-start valve and thermo-time switch are omitted.
- In place of auxiliary-air device, idle-speed actuator and idle-speed controller (control unit) of idle-speed control system.
- Double NTC temperature sensor for Jetronic and idle-speed control.
- Swedish and Swiss versions are also fitted with temperature/part-load-controlled exhaust-gas recirculation.

Note:
The LE2-Jetronic in the Opel 2.2l/4-cylinder engine is essentially similar to that fitted to the Opel 3.0l/6-cylinder engine.
Similar SIS repair instructions:
SIS microcard OPE-503 of 3.84

RAPID DIAGNOSIS CHART FOR UNIVERSAL ADAPTOR

- Universal adaptor 0 684 101 801 and
- Adaptor leads 1 684 463 123 and 1 684 463 137

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system using the universal adaptor.

The rapid diagnosis chart contains the following information:

- Sequence of test steps
- Position of V and Ω program-selector switches
- Notes on how to operate the universal adaptor or other components
- Readings for motortester and multimeter

Rapid diagnosis chart for universal adaptor

Testing of LE 2-Jetronic with the adaptor lead 1 684 463 123

Test step	Switch position V	Switch position Ω	Measurement	Control unit plug between terminals	Remark	Test specifications (reading)
1	5	-	Voltage pulses from ignition coil term. 1 (European version)	1 and 5	Shift gear to neutral. Operate starting motor	Ignition pulses on oscilloscope
			t_Ω signal from electronic ignition spark advance unit term. 5 (Swedish/Swiss version)			Rectangular pulses on oscilloscope
2	6	-	Voltage from control relay term.87	9 and 5	Shift gear to neutral. Operate starting motor	8...15V
3	7	-	Voltage from ignition-starting switch term. 50	4 and 5	Shift gear to neutral. Operate starting motor	8...15V
4	↓	11	Resistance value of temperature sensor NTC I in air-flow sensor term.8	8 and 5	.....	100...200Ω
5	↓	12	Resistance value of potentiometer in air-flow sensor term.7	7 and 5	Bring sensor flap out to stop	60...1000Ω
6	↓	13	Resistance value of double temperature sensor NTC II, term. 10 (engine temperature)	10 and 5	.....	+15...+30° C : 1.45...3.3kΩ +80° C : 280...360Ω

Rapid diagnosis chart for universal adaptor (continued)

Testing of LE 2-Jetronic with the adaptor lead 1 684 463 123

Test step	Switch position	Ω	Measurement	Control unit plug between terminals	Remark		Test specifications (reading)
7	↓	14	Resistance value between ground and output stage term. 13	13 and 5	-----		0 ... 10 Ω
8	↓	16	Resistance value of idle contact in throttle valve switch term.2	2 and 9	Detach plugs from spark-advance unit and idle-speed regulator	Accelerator in rest position Press accelerator a little	0 ... 10 Ω ∞ Ω
9	↓	17	Resistance of full-load contact in throttle valve switch term.3	3 and 9	Plugs remain detached	Accelerator in rest position Press accelerator down fully	∞ Ω 0 ... 10 Ω
10	↓	18	Resistance of all 4 parallel-connected solenoid-operated injection valves term.12	12 and 9	Attach plugs to spark-advance unit and idle-speed regulator.	+20°C : +80°C :	7.0 ... 9.5 Ω 7.2 ... 10.0 Ω

Rapid diagnosis chart for universal adaptor (continued)

Testing of idle-speed control with the adaptor lead 1 684 463 137

Test step	Switch position V	Switch position Ω	Measurement	Idle-speed controller (control unit) between terminals)	Remark	Test specifications (reading)
1	5	-	Voltage impulses from ignition coil term.1	12 and 2	Control unit disconnected. Shift gear to neutral. Operate starting motor.	Ignition pulses on oscilloscope
2	6	-	Voltage from control relay term. 87 b	1 and 2	Shift gear to neutral. Operate starting motor.	8 ... 15 V
3	7	-	Voltage across throttle valve idle contact term. 2 and 18	8 and 2	Connect idle-speed regulator (CU). Shift into neutral, start. Accelerator pedal not depressed.	8 ... 15 V
					Depress accelerator slightly.	Approx. 0 V
4	↓	14	Resistance of double temperature sensor NTC II, term.67 (engine temperatur)	9 and 2	Do not connect idle-speed regulator (CU).	+15... +30°C: 1,45 ... 3,3 kΩ +80°C: 280 ... 360 Ω

Rapid diagnosis chart for universal adaptor (continued)

Testing of idle-speed control with the adaptor lead 1 684 463 137

Test step	Switch position V	Switch position Ω	Measurement	Idle-speed controller (control unit) between terminals	Remark	Test specifications (reading)
5	↓	20	Resistance of idle-speed actuator between term.1 (3) and 2 (4)	3 and 4	.....	+ 15° C... + 30° C : 20...32Ω + 80° C : 24.4...37Ω
6	↓	21	Resistance of idle-speed actuator between term.3 (5) and 2 (4)	5 and 4	.....	+ 15° C...+ 30° C : 18...29.5Ω + 80° C : 22...34Ω
7	↓	21	Pulse ratios at idle speed: European automatic, Swedish 4-speed man./Swiss automatic. 675...725 min^{-1}	5 and 4	Connect idle-speed regulator (CU). Connect dwell-angle tester to black test sockets 1 and 2 on universal test adapter. Engine at operating temperature. Accelerator pedal not depressed.	28...32%
			European 5-gear man./Swedish + Swiss 4-speed man. 775...825 min^{-1}			

TEST SPECIFICATIONS

Pressure regulator

- Fuel pressure: 2.3...2.7 bar

Electric fuel pump

- Fuel delivery at return: at least 750 m^3/30s
- Terminal voltage under load: at least 12V

Temperature sensor NTC II (engine)

Double NTC for LE-Jetronic
and idle-speed control

- Internal electrical resistance of each temp. sensor
  At ambient temperature
  (+15° C...+30° C): 1.45...3.3kΩ
  With engine at operating temperature
  (approx. +80° C): 280...360Ω

Air-flow sensor

- Resistance between:
  Term.8 and 5: 340...450Ω
  Term.7 and 5: (air-flow-sensor flap fully deflected) 60...1000Ω
  Term.9 and 5: 500...760Ω
  Term.8 and 9: 160...300Ω

Start control with NTC II plug disconnected

- Terminal voltage at a solenoid-operated injection valve:

Fall from initial value of greater than approx. 2.5V to approx. 0.3V within approx. 15s starting time.

Test specifications (continued)

Solenoid-operated injection valve

• Internal electrical resistance at +20° C:	15.0...17.5Ω

Idle-speed actuator

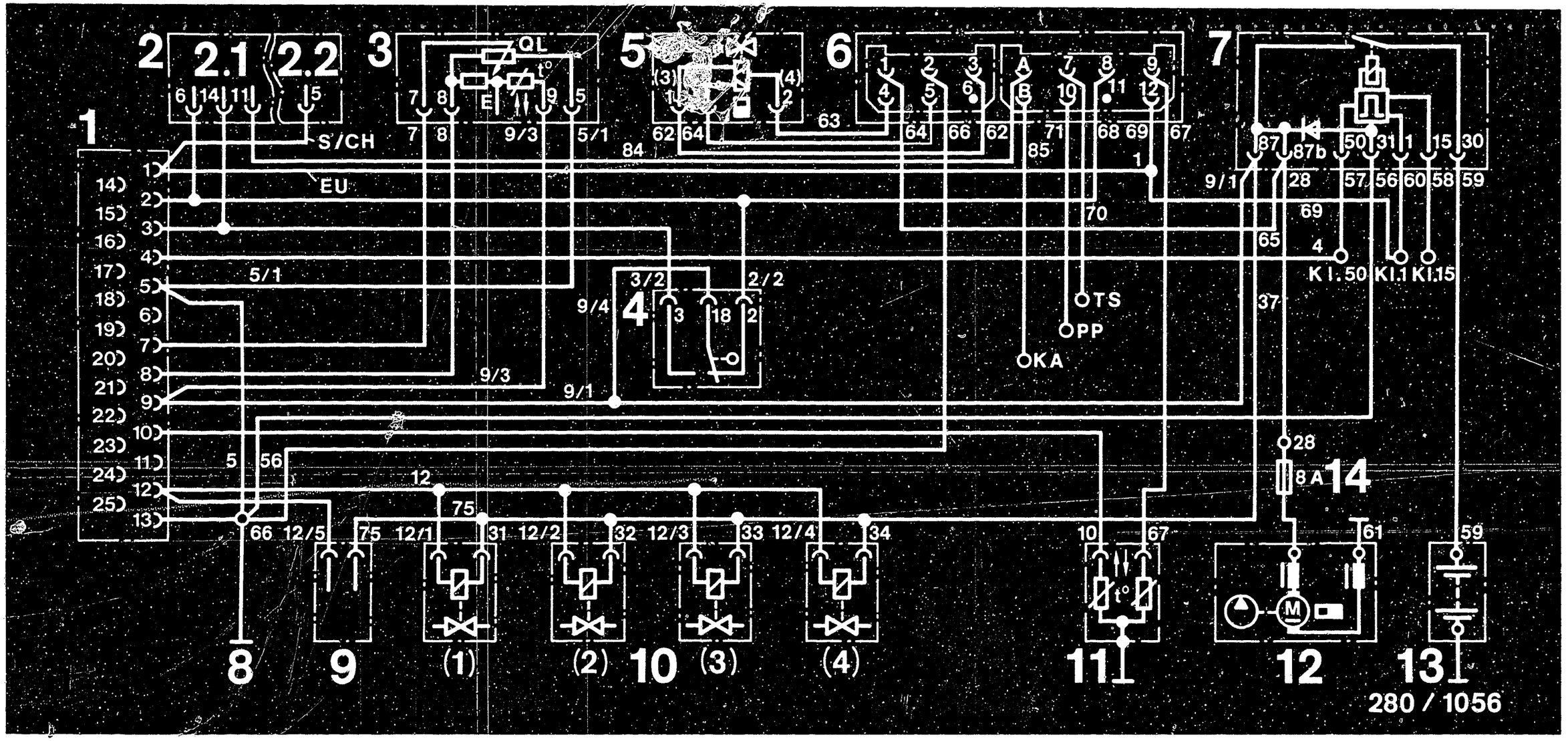
• Internal electrical resistance of each winding	
Term.1 (3) to Term.2 (4)	
+15° C...+30° C	19.0...25.0Ω
+80° C	23.5...30.0Ω
Term.3 (5) and 2 (4)	
+15° C...+30° C	17.0...22.5Ω
+80° C	21.0...27.0Ω

Idle-speed setting

Engine at operating temperature (approx. +80° C).
Render exhaust-gas recirculation (Swedish/Swiss models) inoperative.

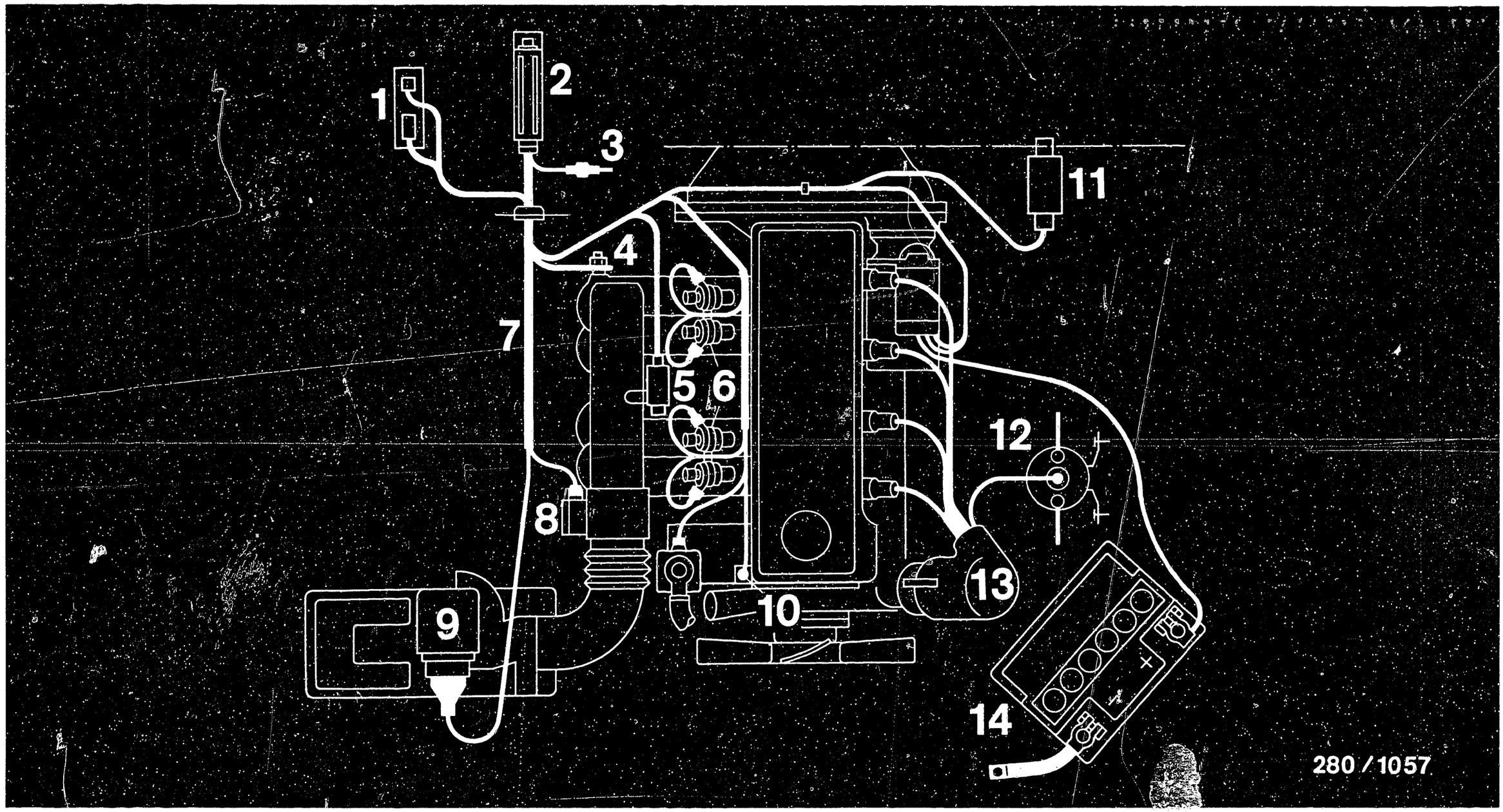
• Idle speed: European version, Automatic, 4-speed man., Swedish/Swiss version, Automatic	675...725 min^{-1}
European version 5-speed man., Swedish/Swiss version 4-speed man.	775...825 min^{-1}
• With pulse ratio:	28...32%
• CO content	0.2...0.5% vol.

See equipment and Autodata microcards for settings for ignition, valve clearance and other engine data.



ELECTRICAL TERMINAL DIAGRAM

1 = Multiple plug for control unit
2 = Electronic ignition spark advance mechanism
2.1 = European version
2.2 = Additional equipment for S/CH version
3 = Air-flow sensor
4 = Throttle-valve switch
5 = Idle-speed actuator
6 = Idle-speed controller
KA = Air-conditioner
PP = Testpin
TS = Temperature switch
7 = Control relay
8 = Central ground for output stages and electronic circuitry
9 = Trip computer
10 = Solenoid-operated injection valves
11 = Double temperature sensor (engine temperature NTC II)
12 = Electric fuel pump
13 = Battery
14 = Fuel pump fuse



ELECTRICAL WIRING DIAGRAM AND ARRANGEMENT OF INDIVIDUAL COMPONENTS

1 = Idle controller
2 = Control unit
3 = Plug-in connection term. 1
4 = Central ground
5 = Idle actuator
6 = Injection valves
7 = Jetronic wiring harness
8 = Throttle-valve switch
9 = Air-flow sensor
10 = Double temperature sensor (engine temperature NTC II)
11 = Control relay
12 = Ignition coil
13 = Ignition distributor
14 = Battery

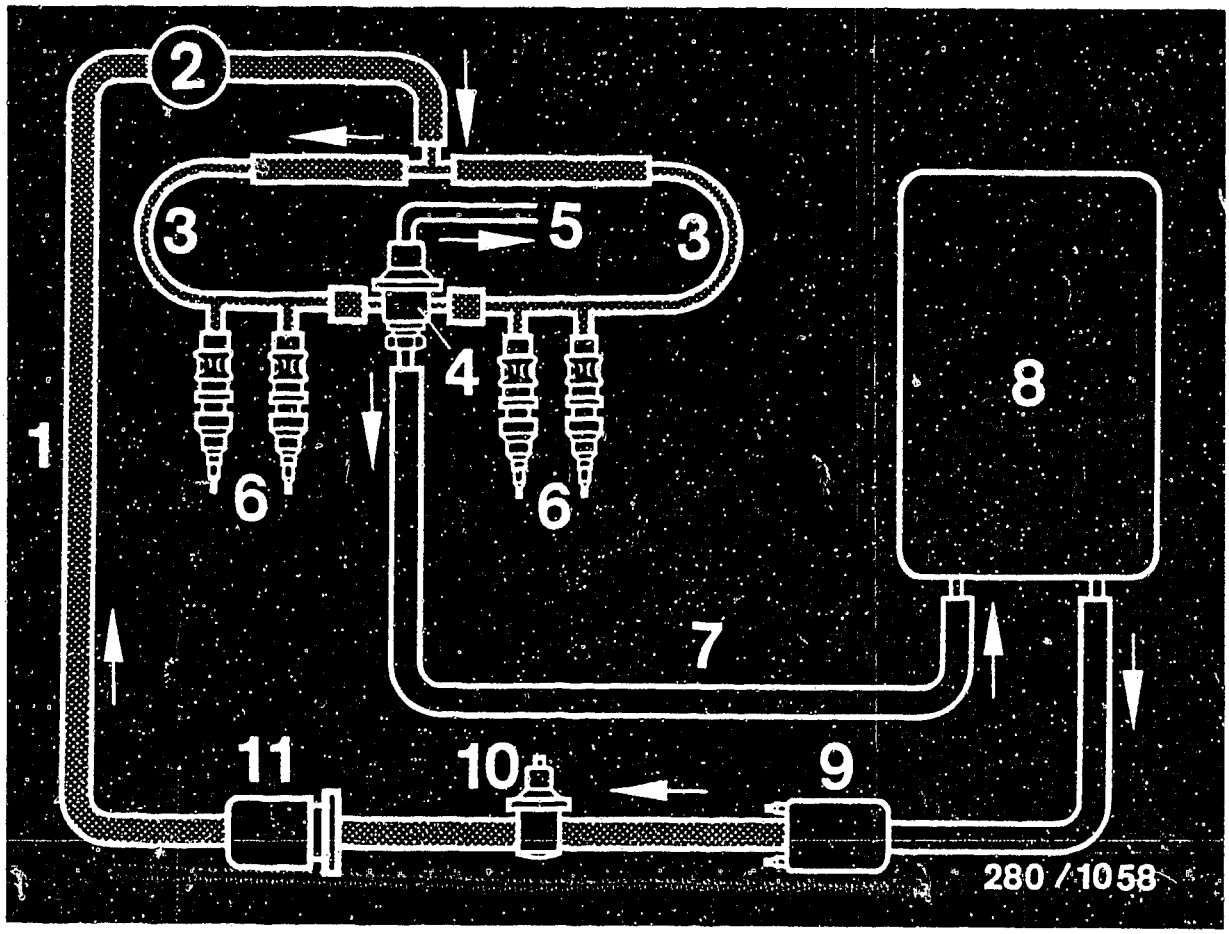
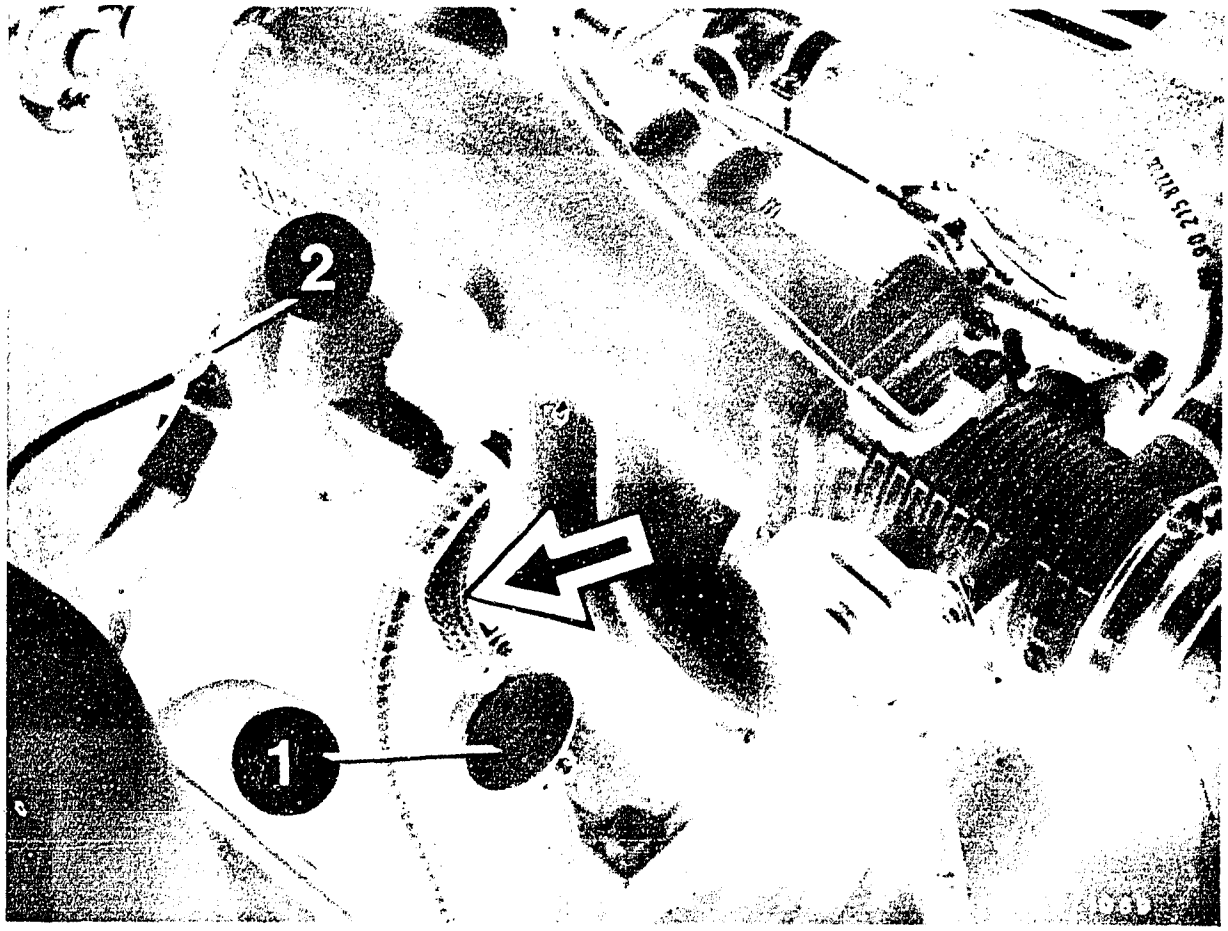


Diagram of fuel lines

Pressureless Fuel pressure

1 = Delivery line
2 = Damper box
3 = Fuel ring main
4 = Pressure regulator
5 = Intake-manifold connection
6 = Injection valves
7 = Return line
8 = Fuel tank
9 = Electric fuel pump
10 = Pressure damper
11 = Fuel filter



1 = Damper unit

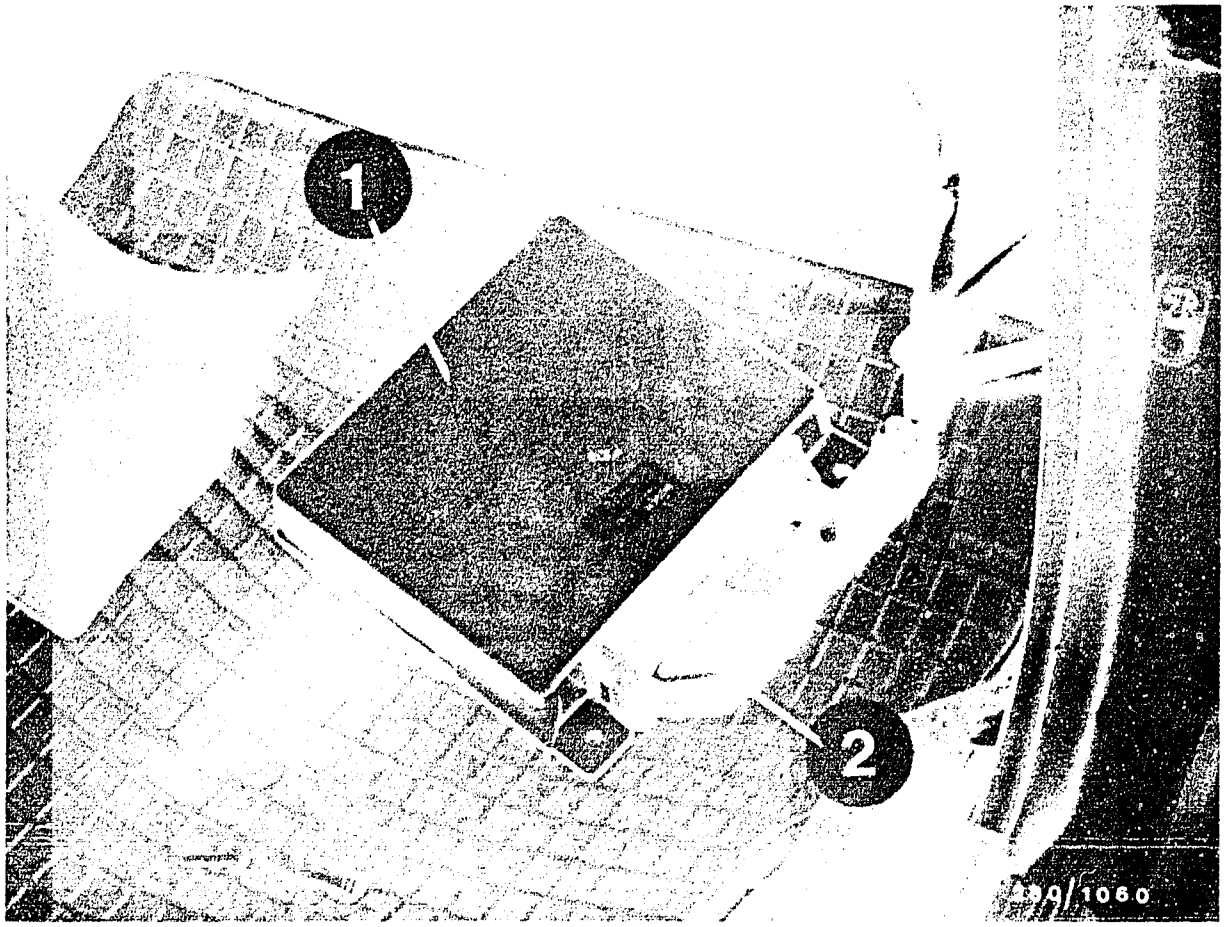
2 = Central ground

Fuel pressure test

For the fuel pressure test, use the pressure gauge and hose of the pressure tester KDJE-P100.

Connect 3-way line KDJE-P100/13 to the outlet (arrow) of the damper unit, and connect this in turn to the hose and pressure gauge.

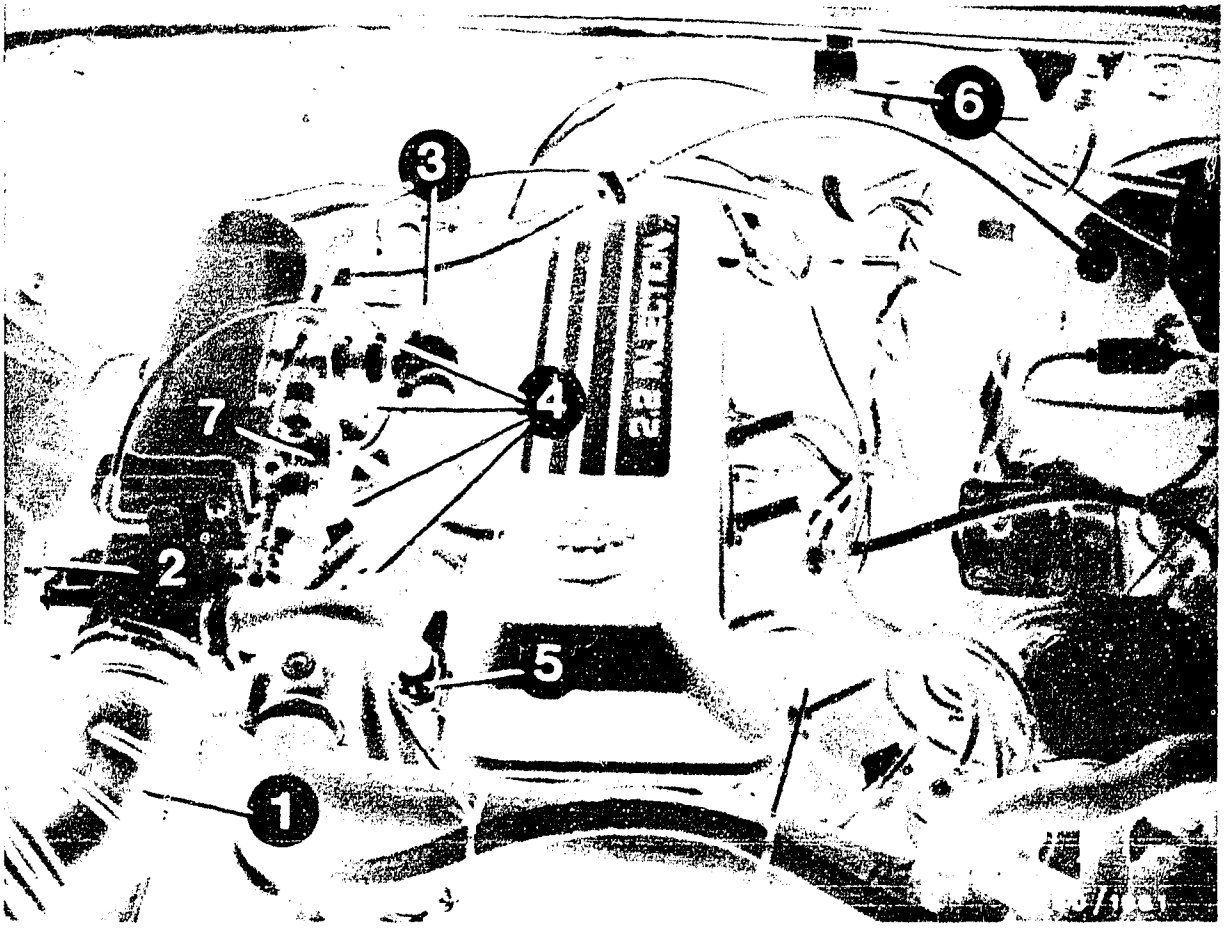
Important: When unscrewing the connector, ensure that no fuel spills onto the hot engine.



1 = Control unit
2 = 25-pin control unit plug

Installation position of components

The idle-speed controller (control unit of the idle-speed control system) is located on top of the LE control unit.



1 = To the air-flow sensor and air filter
2 = Throttle valve switch
3 = Idle-speed actuator
4 = Solenoid-operated injection valves
5 = Double temperature sensor (engine temperature NTC II)
6 = Control relay
7 = Pressure regulator

- Damper unit
  At fuel inlet, under inlet manifold.

- Central ground
  A common ground for the electronic circuitry and output stages is provided on the inlet manifold next to the 4th cylinder.

Fuel system components

- Electric fuel pump and fuel-line-pressure damper

  These two components are located underneath the vehicle on the right-hand side behind the rear axle.

- Fuel filter
  The fuel filter is located underneath the vehicle on the right-hand side in front of the rear axle.

TABLE OF CONTENTS

Special features

- LE2 Jetronic with 25-pin control unit 0 280 001 306/ 307, energized from term. 1 of ignition coil, 5-pin air-flow sensor and 7-pin control relay.
  Solenoid-operated injection valves with brass wire coil.
- Cold-start control, i.e. extra fuel injected through all solenoid-operated injection valves.
- No start valve or thermo-time switch.
- Instead of auxiliary-air device: Idle actuator and idle controller (control unit) of idle-speed control.
- Double NTC for Jetronic and idle-speed control.

Note:
The LE2 Jetronic in the Opel 2.5 l/6-cylinder is basically the same as that in the Opel 3.0 l/6-cylinder.

- Similar SIS repair instructions:
  SIS microcard OPE-503 of 3.84

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

- Universal test adapter 0 684 101 801 and
- Adapter lead 1 684 463 123 and 1 684 463 137

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system with the universal test adapter.
The rapid diagnosis chart contains the following information:

- Sequence of test steps
- Positions of V and Ω program switches
- Notes on how to operate the universal test adapter or other components
- Test specifications or motortester and multimeter

Rapid diagnosis chart for universal test adapter

Testing of LE-Jetronic with adapter lead 1 634 463 123

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between terminals	Remarks	Test specifications (Reading)
1	5	-	Voltage pulses from ignition coil term. 1	1 and 5	Shift gear to neutral, start.	Ignition pulses on oscilloscope
2	6	-	Voltage from control relay term. 87	9 and 5	Shift gear to neutral, start.	8 ... 15 V
3	7	-	Voltage from ignition/starting switch term. 50	4 and 5	Shift gear to neutral, start.	8 ... 15 V
4	↓	11	Resistance combination in air-flow sensor term. 8	8 and 5	---	100 ... 200 Ω
5	↓	12	Resistance of potentiometer in air-flow sensor term. 7	7 and 5	Deflect sensor flap as far as it will go.	60 ... 1000 Ω
6	↓	13	Resistance of double temperature sensor NTC II term. 10 (engine temperature)	10 and 5	--- +15°C...+30°C	1.45 ... 3.3 kΩ
					+80°C	280 ... 360 Ω
7	↓	14	Resistance of output stage ground term. 13	13 and 5	---	0 ... 10 Ω
8	↓	15	Resistance of output stage ground term. 25	25 and 5	---	0 ... 10 Ω

Continued on A5/A6

Rapid diagnosis chart for universal test adapter (continued)

Testing of LE-Jetronic with adapter lead 1 684 463 123

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between terminals	Remarks		Test specifications (Reading)
9	↓	16	Resistance of idle contact in throttle-valve switch term. 2	2 and 9	Detach plugs from ignition trigger box and idle-speed regulator	Accelerator in rest position	0 ... 10 Ω
						Accelerator slightly depressed	∞ Ω
10	↓	17	Resistance of full-load contact in throttle-valve term. 3	3 and 9	Plugs remain detached	Accelerator in rest position	∞ Ω
						Press accelerator down fully (full-load position)	0 ... 10 Ω
					Attach plugs to ignition trigger box and idle-speed regulator.		
11	↓	18	Resistance of 3 parallel-injection valves term. 12 (group I)	12 and 9	---	+20°C: +80°C:	8.2 ... 10.9 Ω 8.7 ... 11.7 Ω
12	↓	19	Resistance of 3 parallel-injection valves term. 24 (group II)	24 and 9	---	+20°C: +80°C:	8.2 ... 10.9 Ω 8.7 ... 11.7 Ω

Rapid diagnosis chart for universal test adapter
Testing of idle-speed control with adapter lead 1 684 463 137

Test step	Switch setting V	Switch setting Ω	Measurement	Idle-speed regulator (CU) between terminal	Remarks	Test specifications (reading)
1	5	–	Voltage pulses from ignition coil, term. 1	12 and 2	Idle-speed regulator (CU) not connected. Shift into neutral, start.	Ignition pulses on oscilloscope
2	6	–	Voltage from control relay, term. 87b	1 and 2	Shift into neutral, start.	8...15 V
3	7	–	Voltage via throttle-valve idle contact, term. 2 and term. 18	8 and 2	Connect idle-speed regulator (CU). Shift into neutral, start. Accelerator pedal not depressed.	8...15 V
					Depress accelerator pedal slightly.	Approx. 0 V
4	▼	14	Resistance of twin temperature sensor NTC II term. 67 (engine temperature)	9 and 2	Do not connect idle-speed regulator (CU). +15...+30 °C +80 °C	 1.45...3.3 kΩ 280...360 Ω
5	▼	20	Resistance of idle actuator, term. 1 and term. 2	3 and 4	--- +15...+30 °C +80 °C	 20...32 Ω 24.5...37 Ω
6	▼	21	Resistance of idle actuator, term. 3 and term. 2	5 and 4	--- +15...+30 °C +80 °C	 18...29.5 Ω 11...24 Ω
7	▼	21	On/off ratio at idle speed Manual transm.: 775...825 min^{-1} Automatic: 675...725 min^{-1}	5 and 4	Connect idle-speed regulator (CU). Connect dwell-angle tester to black test sockets 1 and 2 on universal test adapter. Engine at operating temperature Accelerator pedal not depressed	 30...34 % 27...31 %

TEST SPECIFICATIONS

Pressure regulator

- Fuel pressure: 2.3 ... 2.7 bar

Electric fuel pump

- Delivery at return: min. 850 cm^3/30 s
- Terminal voltage under load: min. 12 V

Temperature sensor NTC II (Engine)

Double NTC for LE-Jetronic
and idle-speed control

- Electrical internal resistance of each temperature sensor:
  At ambient temperature
  (+15°C...+30°C): 1.45...3.3 kΩ
  With engine at op. temp.
  (approx. + 80°C): 280...360 Ω

Air-flow sensor

- Resistance between:
  Term. 8 and term. 5: 340 ... 450 Ω
  Term. 7 and term. 5: (sensor flap fully deflected) 60 ...1000 Ω
  Term. 9 and term. 5: 500 ... 760 Ω
  Term. 8 and term. 9: 160 ... 300 Ω

Cold-start control with NTC II plug disconnected

- Terminal voltage at one injection valve:

  Drops within approx. 15 s cranking time from initially greater than 2.5 V to approx. 0.3 V.

See equipment and Autodata microcards for settings for ignition, valve clearance and other engine data.

Test specifications (Continued)

Solenoid-operated injection valve

• Electrical internal resistance at + 20°C		15.0 ... 17.5 Ω

Idle actuator

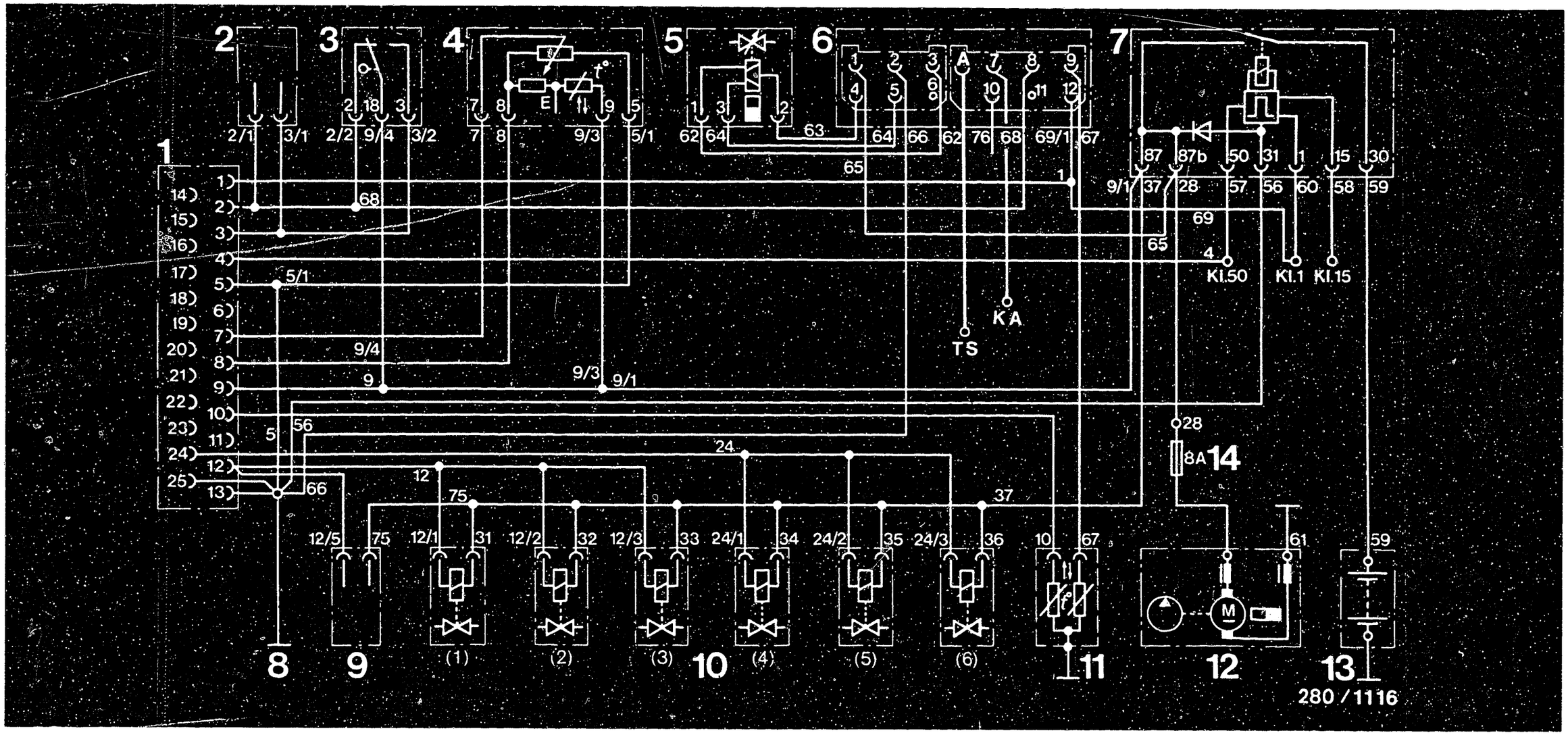
• Electrical internal resistance of each winding		
Term. 1 to term. 2	+15°C...+30°C	19.0 ... 25.0 Ω
	+80°C	23.5 ... 30.0 Ω
Term. 3 to term. 2	+15°C...+30°C	17.0 ... 22.5 Ω
	+80°C	21.0 ... 27.0 Ω

Idle adjustment

Engine at operating temperature (approx. +80°C)

• Idle speed:	
Manual transmission	775 ... 825 min^{-1}
with on/off ratio	30 ... 34 %
Automatic	675 ... 725 min^{-1}
with on/off ratio	27 ... 31 %
• CO concentration	0.2 ... 0.5 vol.%

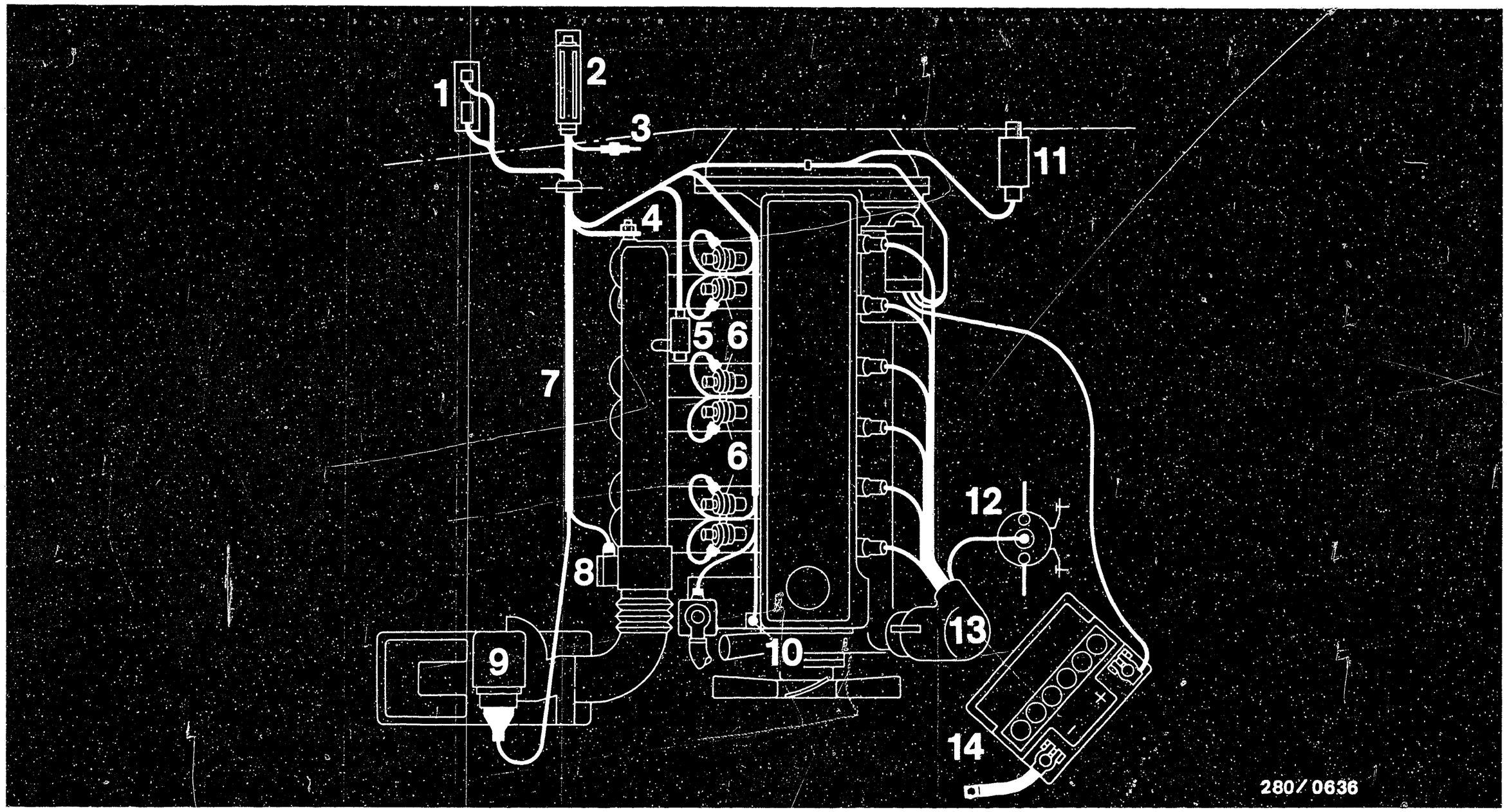
See equipment and Autodata microcards for settings for ignition, valve clearance and other engine data.



ELECTRICAL TERMINAL DIAGRAM

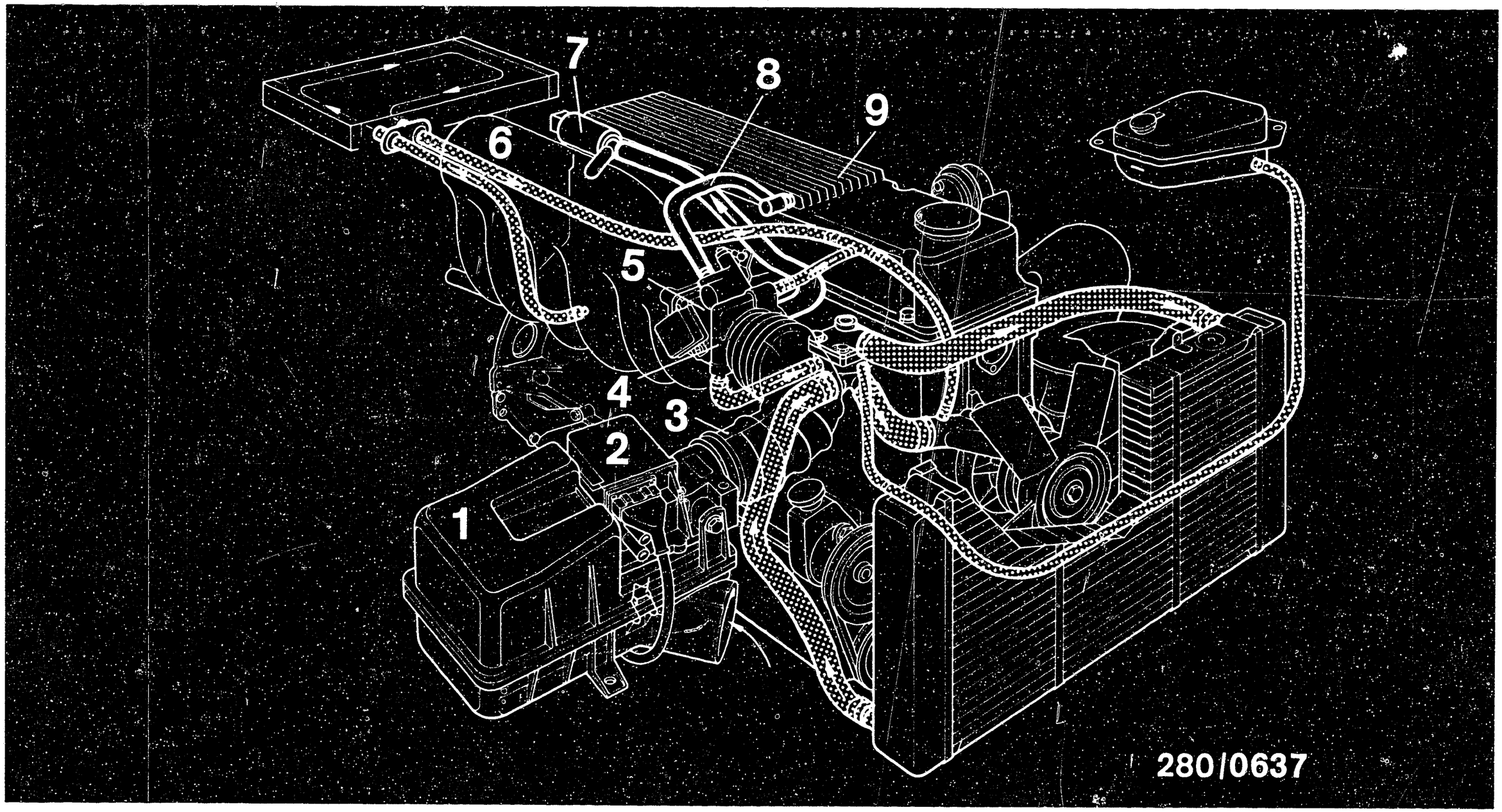
1 = Multiple plug to control unit
2 = Ignition trigger box
3 = Throttle-valve switch
4 = Air-flow sensor
5 = Idle actuator
6 = Idle controller (control unit)
7 = Control relay
8 = Central ground - output stages and electronics
9 = Trip computer
10 = Injection valves
11 = Double temperature sensor (engine temperature NTC II)
12 = Electric fuel pump
13 = Battery
14 = Pump fuse

KA = Air conditioner
TS = Thermo-switch



ELECTRICAL WIRING DIAGRAM AND ARRANGEMENT OF INDIVIDUAL COMPONENTS

1 = Idle controller
2 = Control unit
3 = Plug-in connection term. 1
4 = Central ground
5 = Idle actuator
6 = Injection valves
7 = Jetronic wiring harness
8 = Throttle-valve switch
9 = Air-flow sensor
10 = Double temperature sensor (engine temperature NTC II)
11 = Control relay
12 = Ignition coil
13 = Ignition distributor
14 = Battery



DIAGRAMS OF AIR AND FUEL LINES

Diagram of air lines

Air hose lines

Water hose lines

1 = Air filter
2 = Air-flow sensor
3 = Air-guide hose
4 = Intake manifold heating
5 = Throttle-valve assembly
6 = Intake manifold
7 = Idle actuator
8 = Crankcase breather
9 = Valve cover

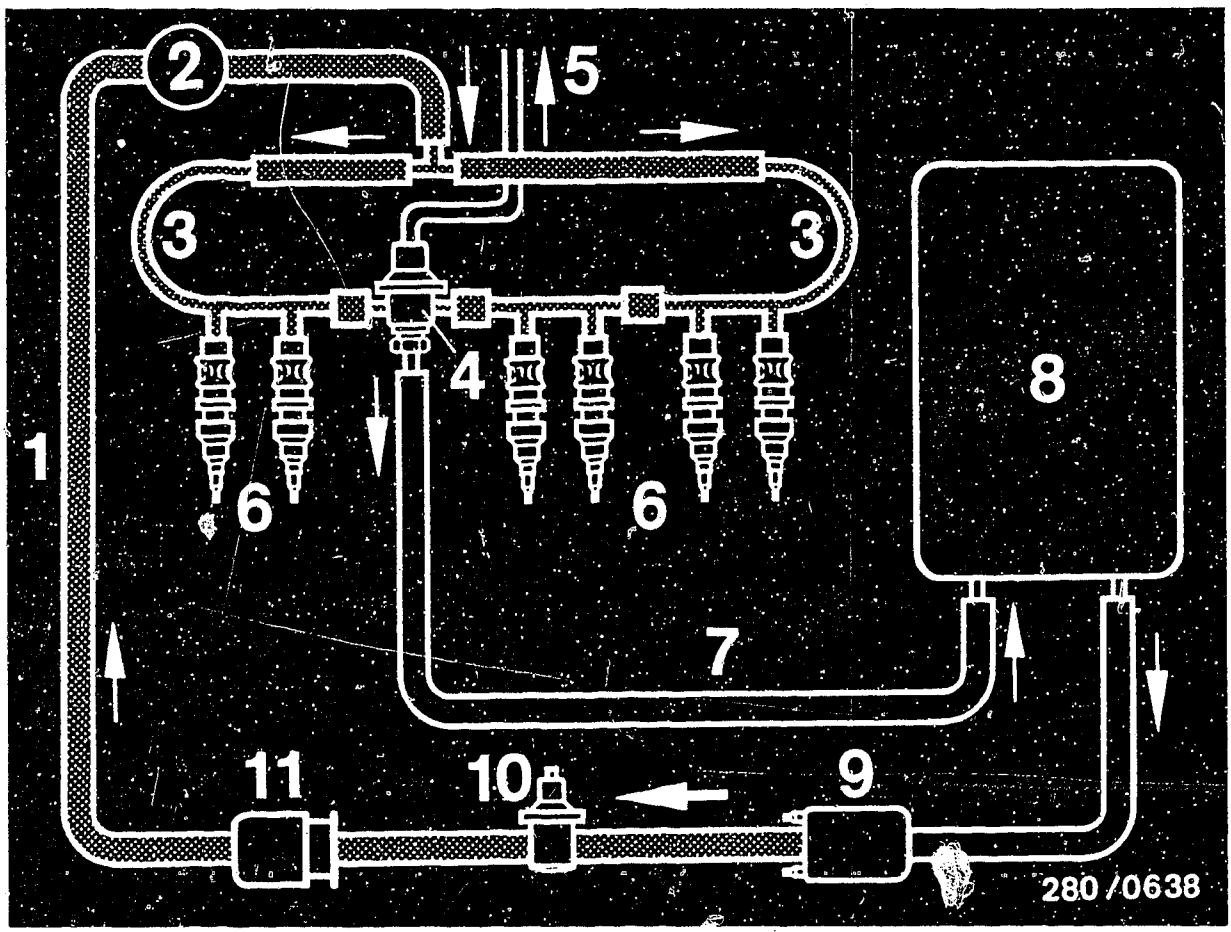
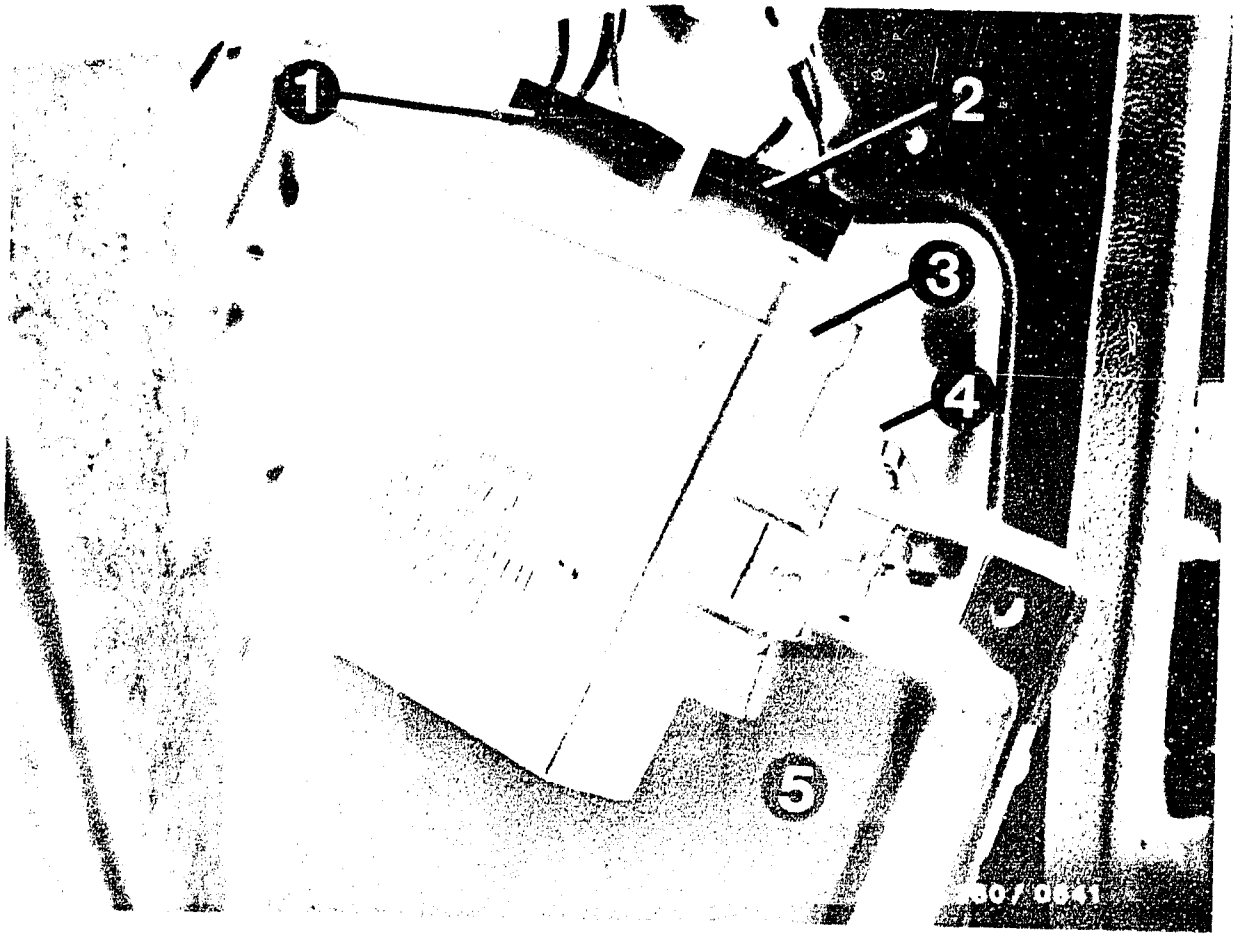


Diagram of fuel lines

Pressureless

Fuel pressure

1 = Delivery line
2 = Damper box
3 = Fuel ring main
4 = Pressure regulator
5 = Intake-manifold connection
6 = Injection valves
7 = Return line
8 = Fuel tank
9 = Electric fuel pump
10 = Pressure damper
11 = Fuel filter



Idle-speed control

1 = 8-pin plug
2 = 6-pin plug
3 = Idle controller (control unit)

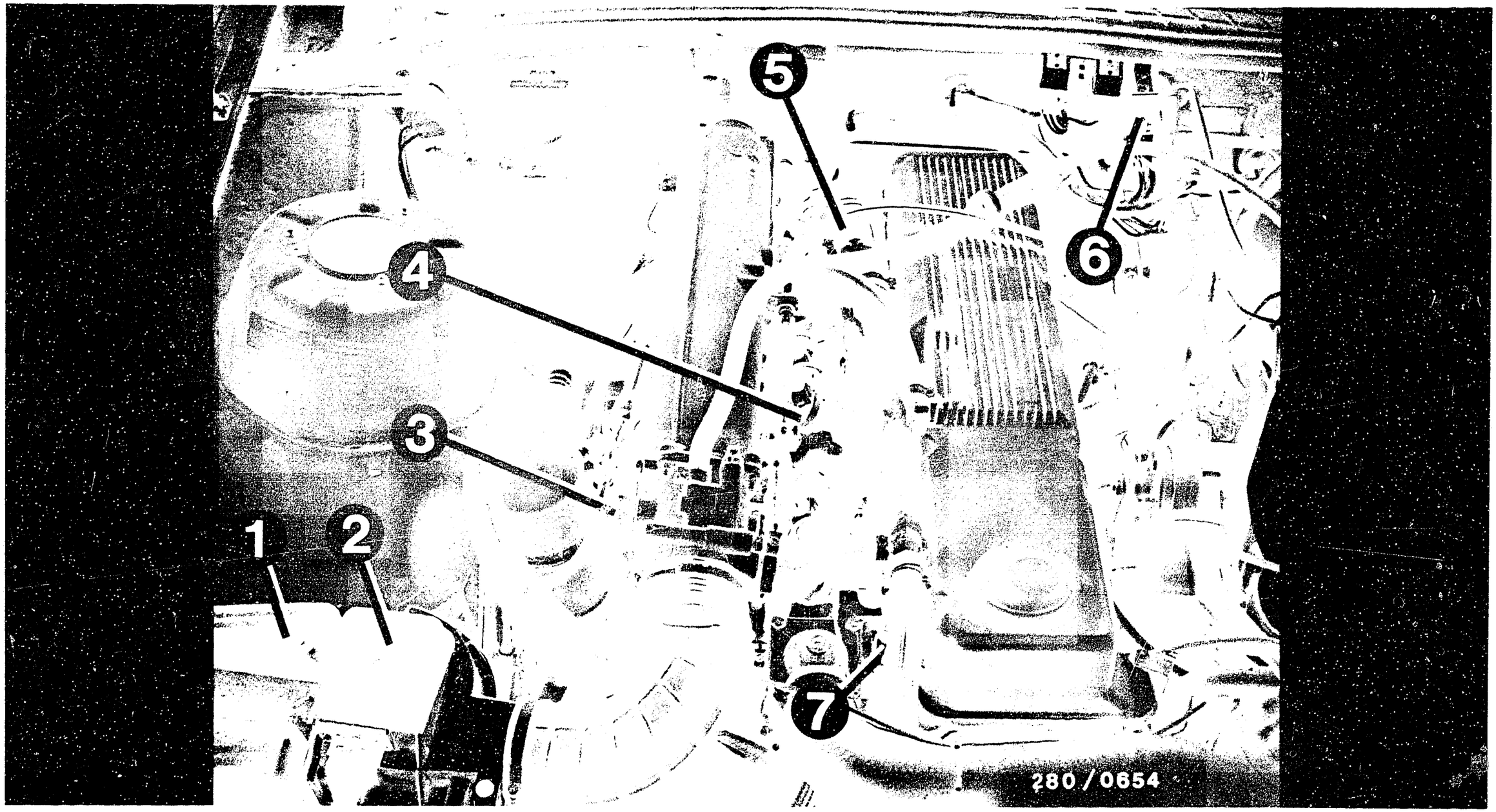
LE-Jetronic

4 = 25-pin control-unit plug
5 = Control unit

Installation position of components

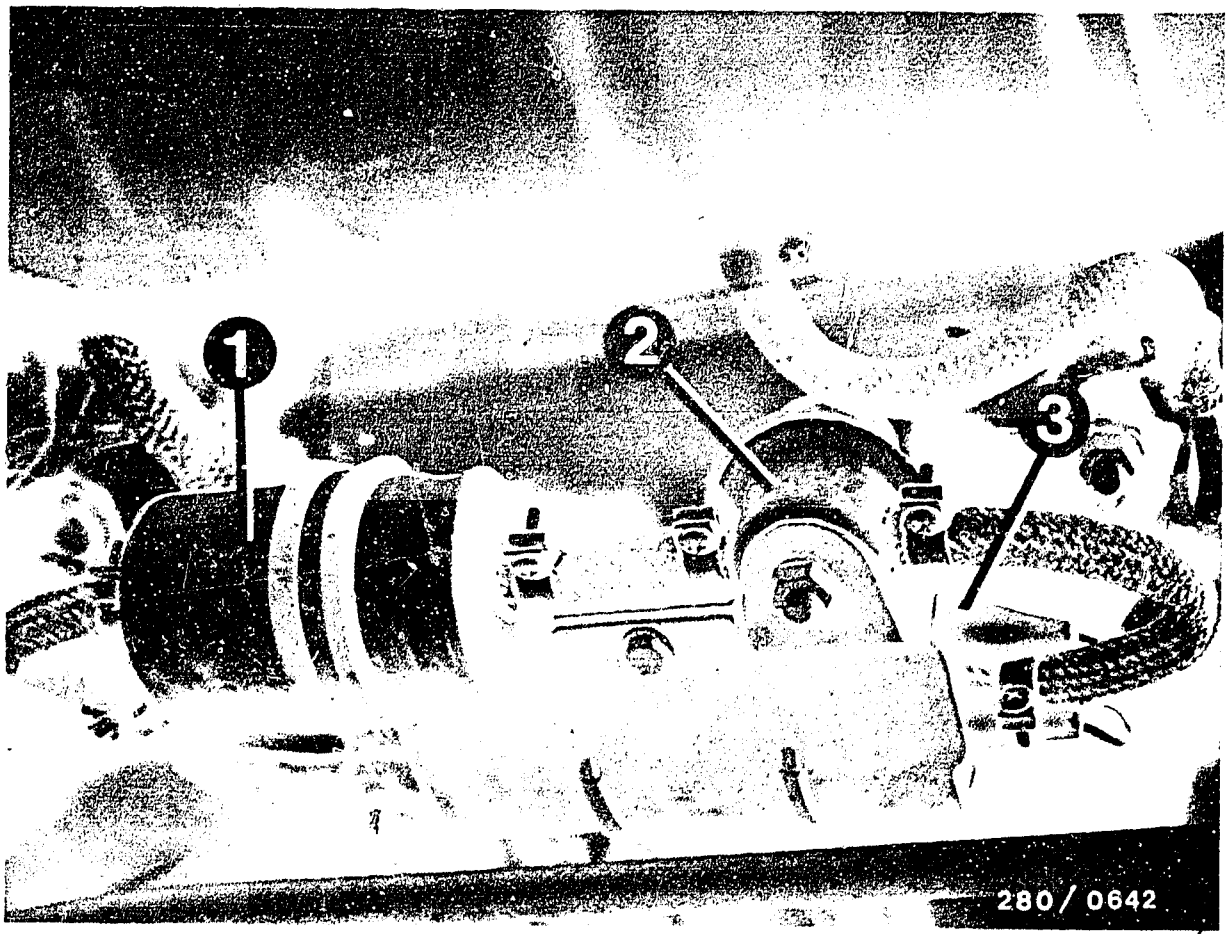
• Control units in passenger compartment

All indications "right" and "left" refer to the forward direction of travel.
Both control units are situated one on top of the other in the front-passenger footwell at the bottom right.
LE-Jetronic - Connect universal test adapter with 25-pin adapter lead to control-unit plug.
Idle-speed control - Connect universal test adapter with 6/8-pin adapter lead between both plugs and idle controller (control unit).



• Arrangement of components on engine

1 = Air filter
2 = Air-flow sensor
3 = Throttle-valve switch
4 = Injection valves
5 = Idle actuator
6 = Control relay
7 = Double temperature sensor (engine temperature NTC II)



1 = Fuel filter
2 = Pressure damper
3 = Electric fuel pump;
protected against dirt by holding plate
(partially obscured in the picture).

• Fuel-supply components

All three components are mounted on the underside of the vehicle to the right of the fuel tank.

- Damper unit

  At fuel inlet, under intake manifold.

- Central ground

  Common ground for electronics and output stage on intake port of cylinder 6.

- Pressure regulator

  On fuel ring main between intake ports of cylinders 4 and 5.

TABLE OF CONTENTS

SPECIAL FEATURES

- L-Jetronic version LE2 with 25-pin control unit, 5-pin air-flow sensor, 7-pin control relay; 0 280 230 010 with engine-speed limitation of 6600 min-1. Solenoid-operated injection valves with brass wire coil.
- Cold-start control, i.e. additional fuel injected through all injection valves.
- No start valve or thermo-time switch.
- In-tank electric fuel pump
- Vehicles for Sweden and Switzerland are additionally equipped with secondary-air induction (Pulsair).

Notes:
The L-Jetronic version LE2 in the Peugeot 205 GTI is basically the same as that in the Peugeot 505 GTI.

- Similar SIS repair instructions:
  SIS microcard PEU-502 of 5.84

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

- Universal test adapter 0 684 101 801 and
- Adapter lead 1 684 463 123

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

- Sequence of test steps
- Settings of V and Ω program switches
- Notes on how to operate the universal test adapter or other components.
- Test specifications for motortester and multimeter

Rapid diagnosis chart for universal test adapter

Test step	Switch setting V	Switch setting Ω	Measurement	Remarks	Test specifications (reading)
1	5	-	Voltage pulses from ignition coil terminal 1. On control unit plug between terminals 1 and 5.	Shift to neutral, start.	Ignition pulses on oscilloscope
2	6	-	Voltage from control relay term. 87b. On control unit plug between terminals 9 and 5.	Shift to neutral, start.	8 ... 15 V
3	7	-	Voltage from starting motor term. 50. On control unit plug between terminals 4 and 5.	Shift to neutral, start.	8 ... 15 V
4	↓	11	Resistance of temperature sensor NTC I in air-flow sensor term. 8. On control unit plug between terminals 8 and 5.	---	100 ... 200 Ω
5	↓	12	Resistance of potentiometer in air-flow sensor term. 7. On control unit plug between terminals 7 and 5.	Deflect air-flow sensor flap as far as it will go.	60 ... 1000 Ω
6	↓	13	Resistance of temperature sensor NTC II term. 10 (engine temperature). On control unit plug between terminals 10 and 5.	+15° ... +30° C: +80° C:	1.45 ... 3.3 kΩ 280 ... 390 Ω
7	↓	14	Resistance of output stage ground term. 13. On control unit plug between terminals 13 and 5.	----	0 ... 10 Ω
8	↓	16	Resistance of idle contact in throttle-valve switch term. 2. On control unit plug between terminals 2 and 9.	Accelerator in rest position: Accelerator slightly depressed:	0 ... 10 Ω ∞ Ω
9	↓	17	Resistance of full-load contact in throttle-valve switch term. 3. On control unit plug between terminals 3 and 9.	Accelerator in full-load position: Accelerator in rest position:	0 ... 10 Ω ∞ Ω
10	↓	18	Resistance of all 4 parallel-connected solenoid-operated injection valves term. 12. On control unit plug between terminals 12 and 9.	---	+20° C: 7.0 ... 9.5 Ω +80° C: 7.2 ... 10.0 Ω

In addition, check the following leads for continuity (Set value 0 Ω):
(These leads are not covered with the universal test adapter during the rapid diagnosis).

- From control unit plug terminal 9 to auxiliary-air device plug 48.
- From control unit plug terminal 13 to auxiliary-air device plug M24.
- From control relay terminal 76 to electric fuel pump term. 76.
- From electric fuel pump to vehicle ground M76.

TEST SPECIFICATIONS

Pressure regulator

• Fuel pressure:	2.8 ... 3.2 bar

Electric fuel pump

- Fuel delivery at return: min. 700 cm^3/30 s
- Terminal voltage under load: min. 12 V

Auxiliary-air device

• Electrical internal resistance	40 ... 75 Ω

Temperature sensor NTC II (engine)

• Electrical internal resistance at ambient temperature (+15° C ... +30° C):	1.45 ... 3.3 kΩ
with engine at op. temp. (approx. +80° C):	280 ... 360 Ω

Air-flow sensor

• Resistance between:	
term. 8 and term. 5:	340 ... 450 Ω
term. 7 and term. 5:	60 ...1000 Ω 1)
term. 9 and term. 5:	500 ... 760 Ω
term. 8 and term. 9:	160 ... 300 Ω

1) (Air-flow sensor flap fully deflected)

Cold-start control with NTC II plug disconnected

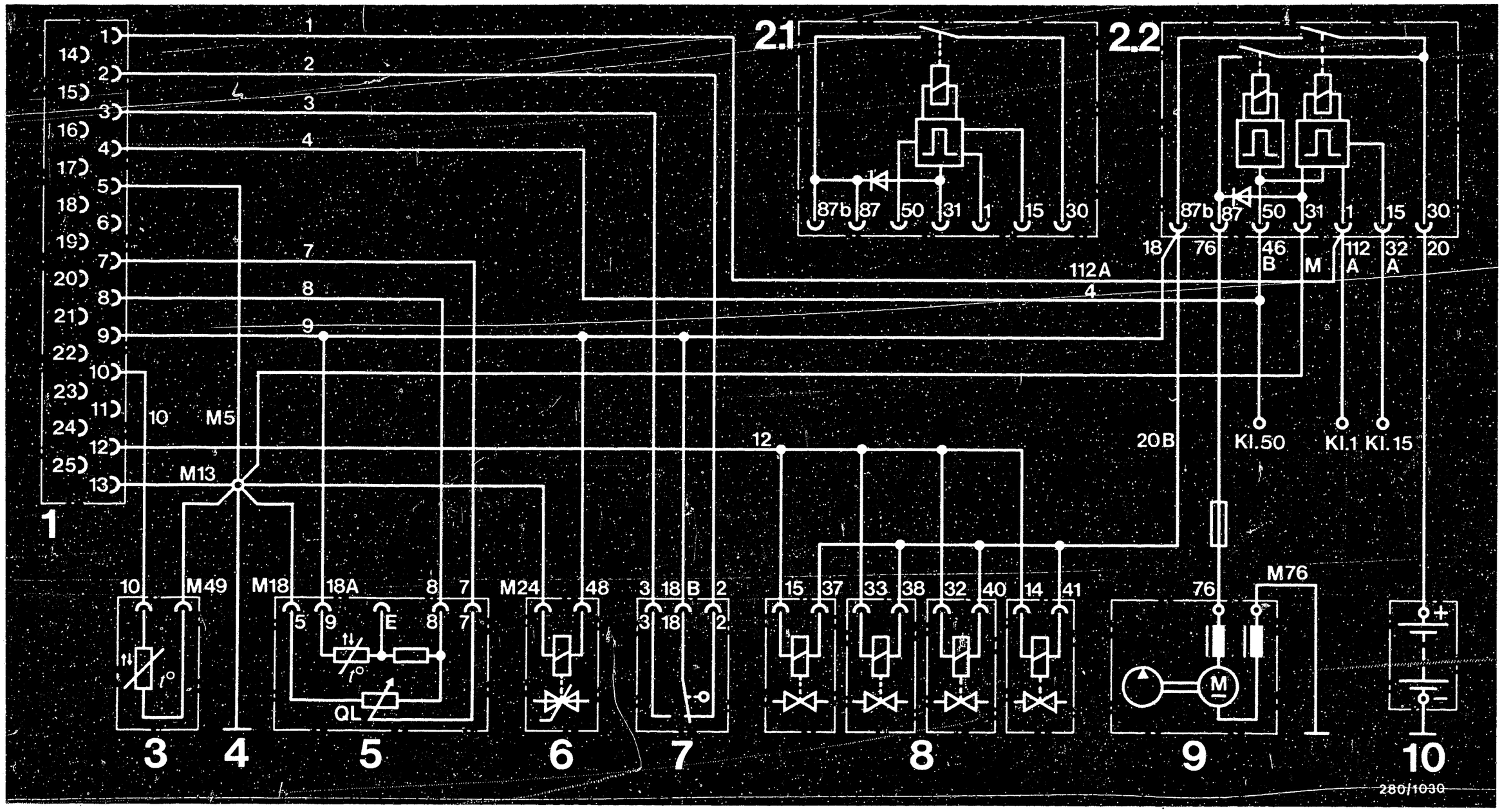
- Terminal voltage at one injection valve:

  drops from initially approx. 2.5 V within approx. 15 sec. cranking time to approx. 0.3 V.

Solenoid-operated injection valve	
• Electrical internal resistance at +20° C:	15.0 ... 17.5 Ω
Idle adjustment with engine at normal operating temperature, approx. +80° C	
• Idle speed:	
Europe version	850 ... 900 min-1
Sweden/Switzerland version	900 ... 950 min-1
• CO concentration:	1.0 ... 2.0 vol.%

On vehicles for Sweden and Switzerland, render the secondary-air induction system inoperative in order to make CO adjustment.

See equipment and Autodata microfiches for settings for ignition, valve clearance and other engine data.



ELECTRICAL TERMINAL DIAGRAM

1 = Control unit plug
2.1 = Control relay 0 280 230 006 without engine-speed limitation
2.2 = Control relay 0 280 230 010 with engine-speed limitation
3 = Temperature sensor II (engine temperature)
4 = Central ground for output stage and electronics
5 = Air-flow sensor
6 = Auxiliary-air device
7 = Throttle-valve switch
8 = Injection valves
9 = Electric fuel pump
10 = Battery

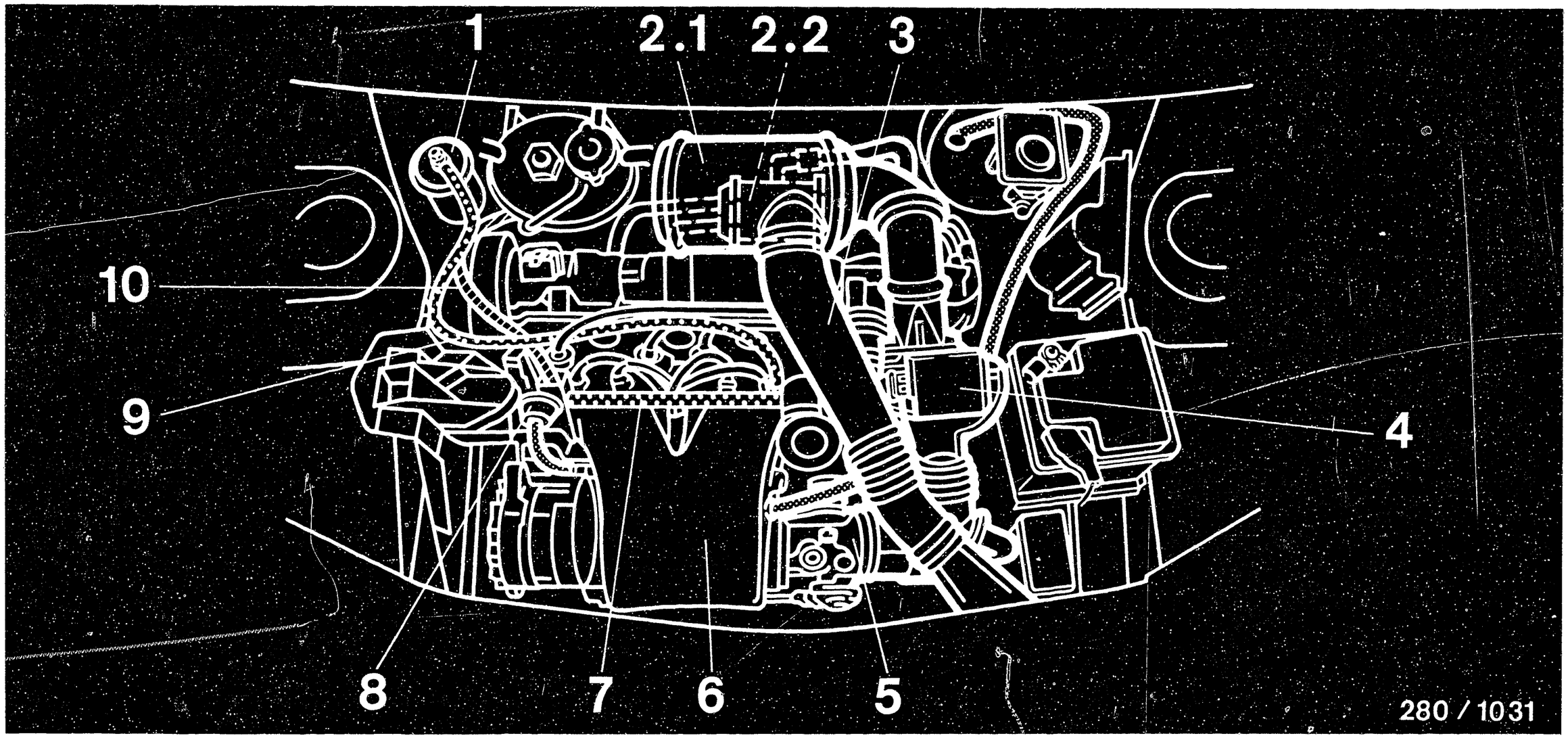


DIAGRAM OF AIR AND FUEL LINES

• Air lines
——— = Atmospheric pressure
▒▒▒▒ = Intake-manifold pressure

• Fuel lines
▒▒▒▒ = Fuel pressure
▨▨▨▨ = Pressureless

1 = Fuel filter
2.1 = Air filter
2.2 = Air distributor for secondary-air induction (on Sweden and Switzerland versions only)
3 = Air-guide hose
4 = Air-flow sensor
5 = Throttle-valve assembly
6 = Intake manifold
7 = Fuel-distribution pipe
8 = Pressure regulator
9 = Delivery line (inlet)
10 = Return line

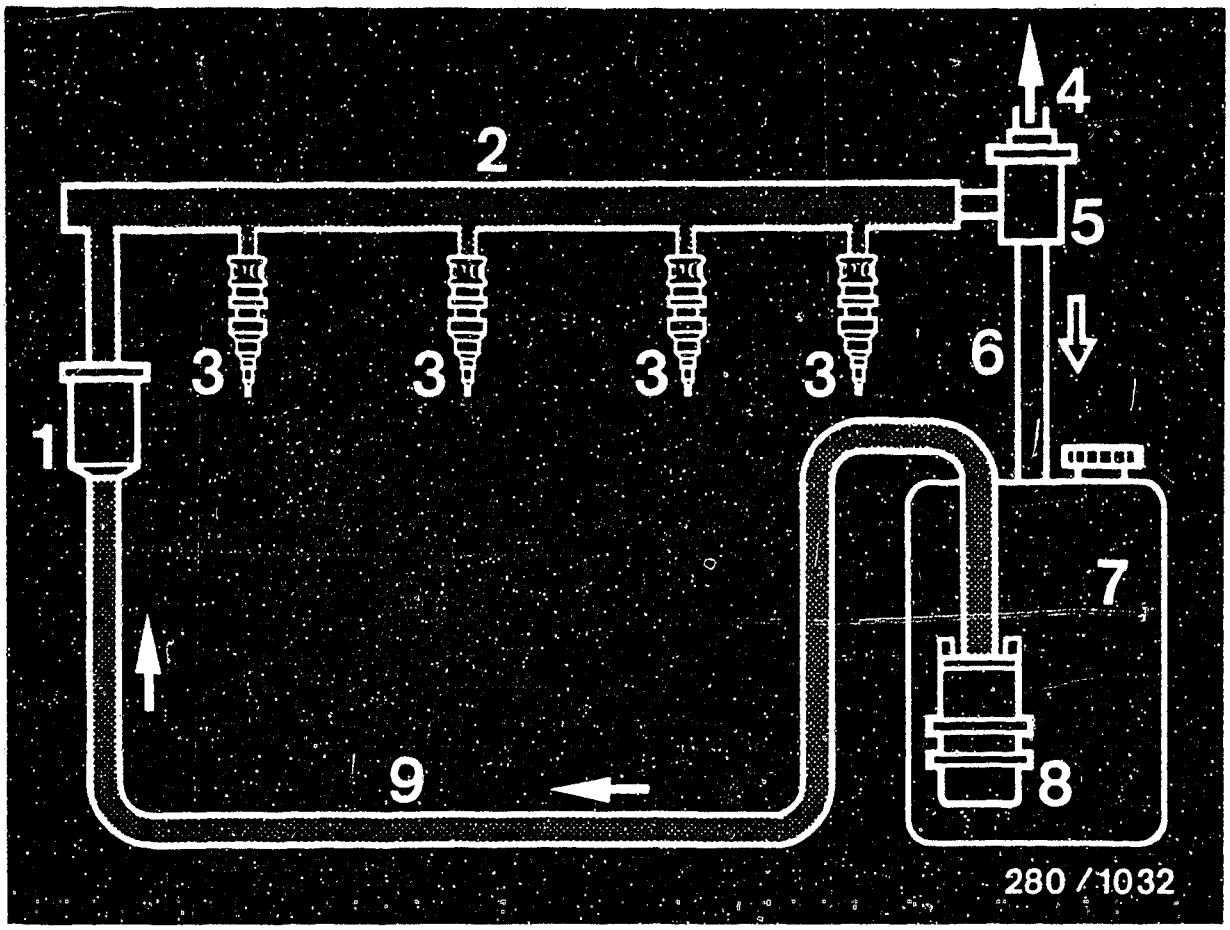
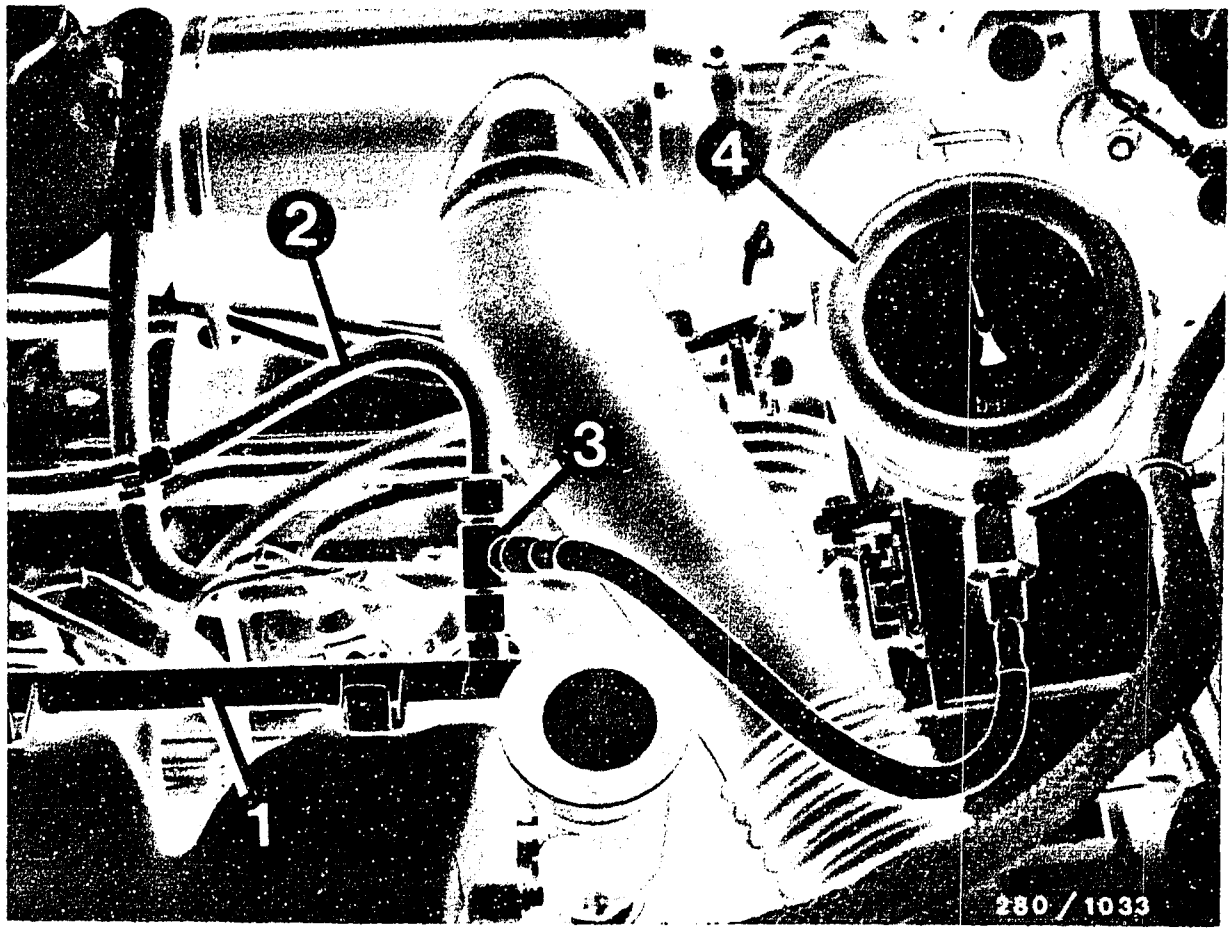


DIAGRAM OF FUEL LINES

pressureless

Fuel pressure

1 = Fuel filter
2 = Fuel-distribution pipe
3 = Solenoid-operated injection valve
4 = Intake-manifold pressure connection
5 = Pressure regulator
6 = Return line
7 = Fuel tank
8 = Electric fuel pump
9 = Delivery line



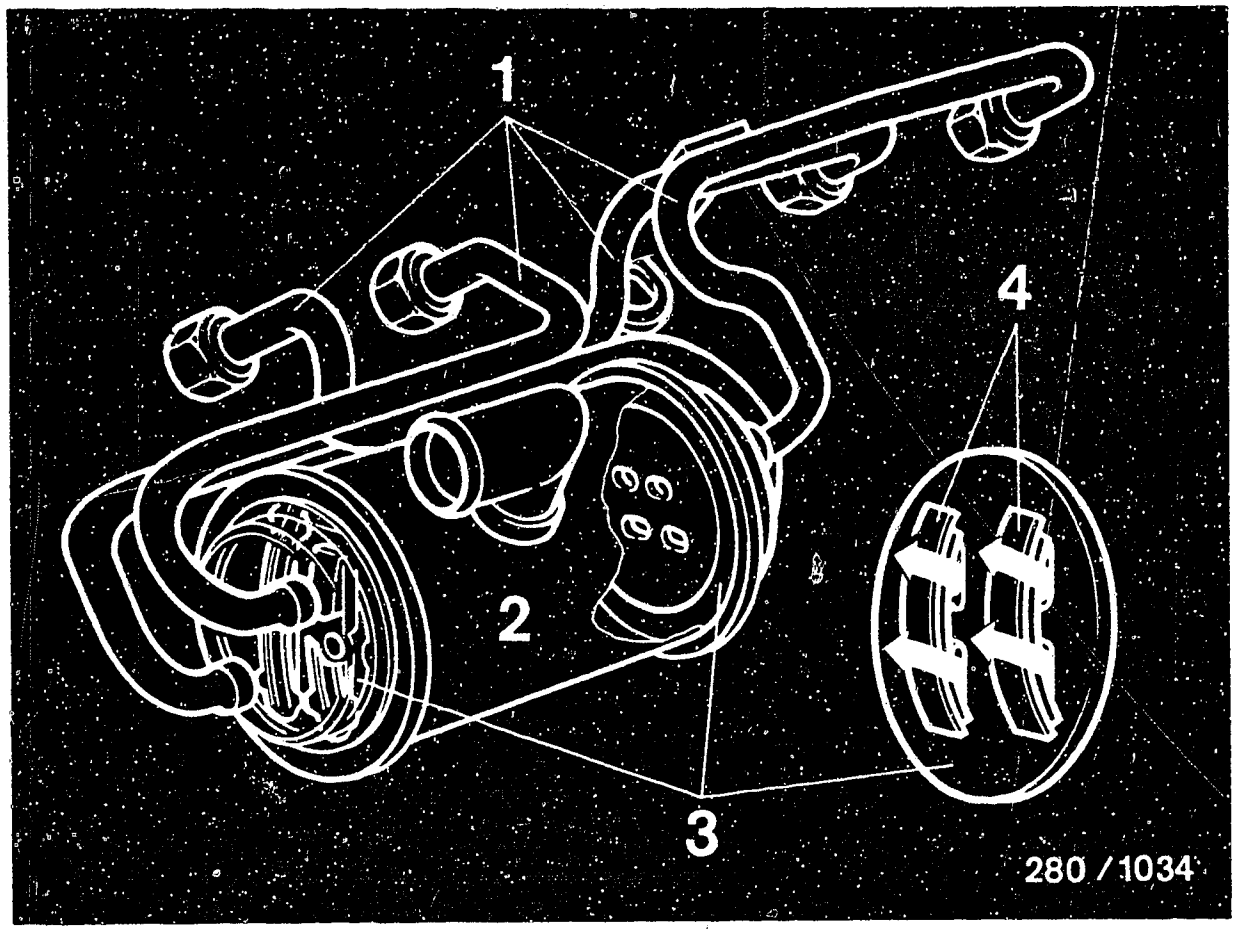
1 = Fuel-distribution pipe
2 = Delivery line, inlet
3 = Connecting part KDJE-P100/14
4 = Pressure gauge of pressure tester KDJE-P 100

FUEL PRESSURE TEST

Use pressure gauge and hose line of pressure tester KDJE-P 100 for the pressure test.

Connect connecting part KDJE-P100/14 in between at the fuel-distribution pipe inlet and connect hose line with pressure gauge at the lateral threaded fitting.

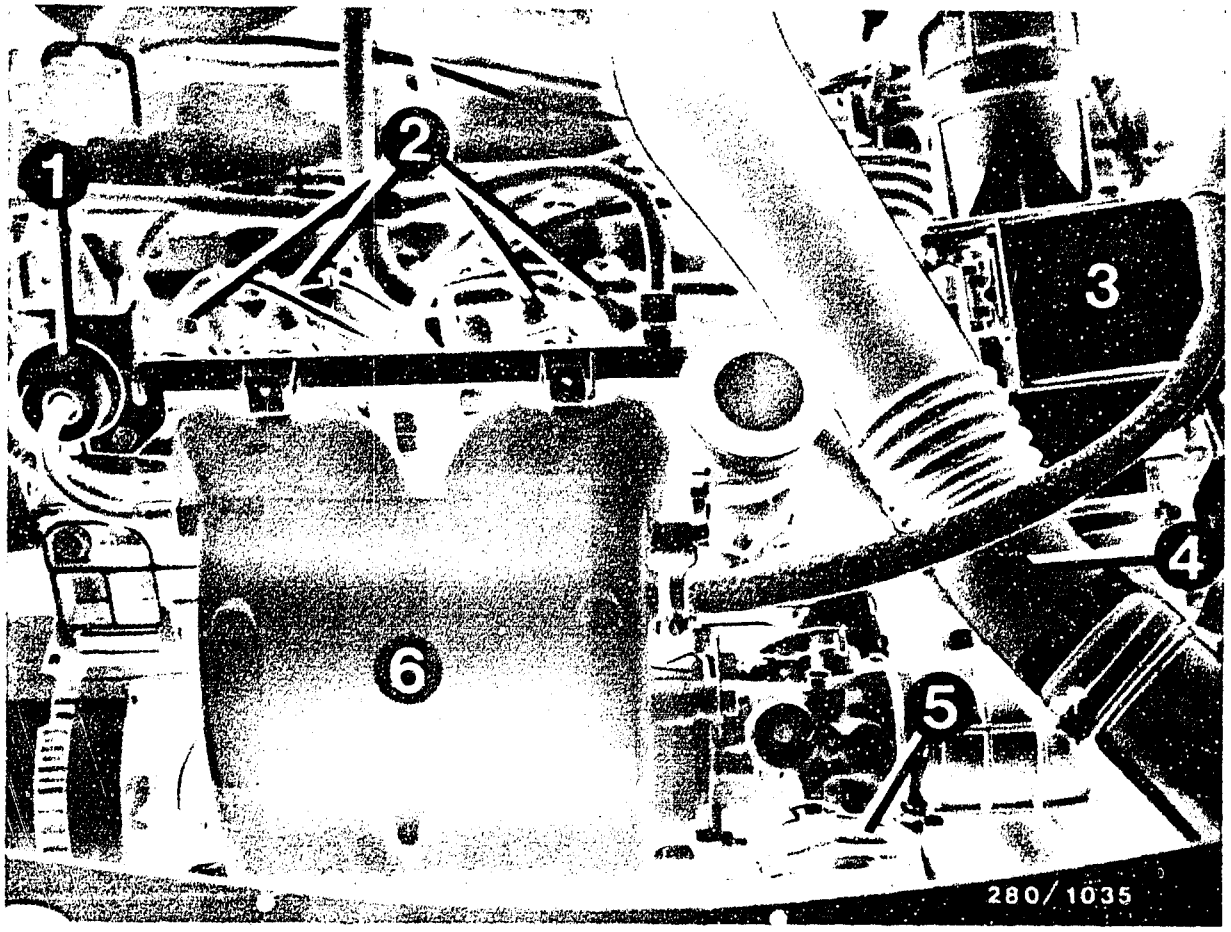
Caution: When opening the screw connection, make sure that no fuel gets onto hot parts of the engine.



1 = Fresh-air lines to the individual exhaust ports
2 = Air distributor
3 = End faces
4 = Non-return valve

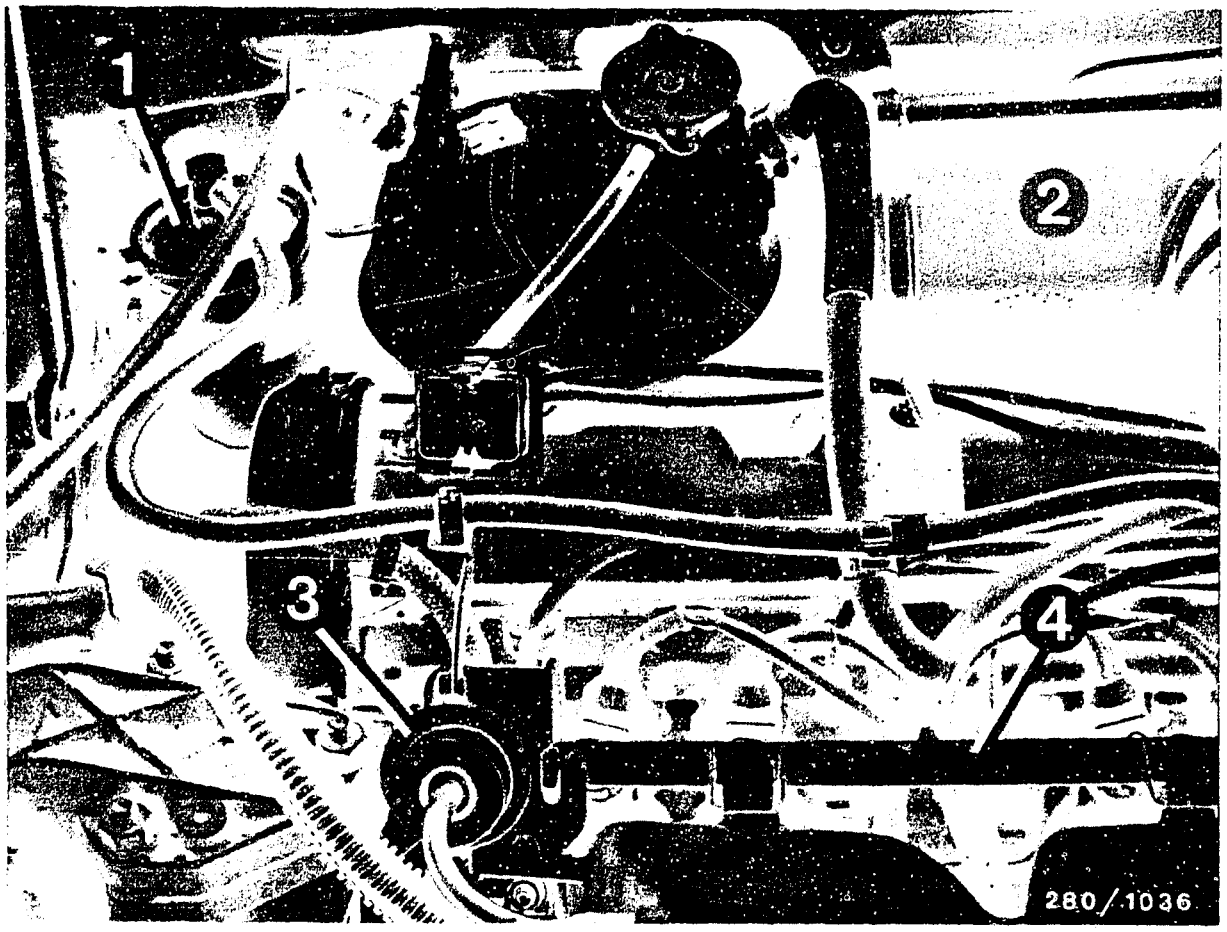
Secondary-air induction (Pulsair)
Only on vehicles for Sweden and Switzerland.

The system consists of an air distributor which is connected at the bottom on the air filter.
Non-return valves at both end faces guarantee the automatic induction of fresh air into the exhaust ports when the exhaust valves are closed.



INSTALLATION POSITION OF COMPONENTS

1 = Pressure regulator
2 = Solenoid-operated injection valves with O-ring sealing
3 = Air-flow sensor
4 = Air guide
5 = Throttle-valve switch
6 = Intake manifold



1 = Fuel filter
2 = Air filter
3 = Pressure regulator
4 = Fuel-distribution pipe

- Control unit
  Screwed down in glove compartment.

- Auxiliary-air device
  Under ignition distributor, on left on engine block.

- Temperature sensor
  Next to auxiliary-air device, on left on engine block.

- Control relay
  Mounted in front of battery, at bottom on vehicle frame and protected against splashwater by a cap.

- Central ground terminal
  Front left, above control relay.

- In-tank electric fuel pump
  Mounted together with a strainer, upright on the bracket which is screwed onto the fuel tank at the top.

Table of contents

1) Rapid diagnosis chart for headlight vertical aim control (LWR)

The following rapid diagnosis chart makes it possible for the experienced expert to check the LWR system with headlight aiming device 0 681 130 .. or 0 684 100 .. . The contents of this chart are restricted to the following:

- Sequence of test steps
- Setting instructions and test specifications (readings on headlight aiming device)
- References to coordinates of the respective detailed testing and trouble-shooting program.

If detailed information and instructions are required, always proceed according to the test and adjustment section starting on Coordinate B 1.

Before testing, make sure of the following:

- Tyre pressures O.K.
- Vehicle ready for the road and unladen (in accordance with StVZO* § 42 Sect. 3)
- Lower beam switched on. (Briefly switch on ignition to expose headlamps).
- Headlight aiming device set up in accordance with operating instructions.

Tests and adjustment operations must always be carried out on both headlights.

- Lower beam switched on. (Briefly switch on ignition to expose headlamps).
- Headlight aiming device set up in accordance with operating instructions.

Tests and adjustment operations must alwags be carried out on both headlights.

* StVZO = FMVSS (in USA), CUR (in GB)

Rapid diagnosis chart for testing with headlight aiming device 0 681 130 .. or 0 684 100 ..

Always carry out tests on both headlights!

Test step	Set manual adjustment device on vehicle to:	Set headlight aiming device to:	Set headlight to:	Reading on headlight aiming device	Coordinates
1	Lock-in position (StVZO* Latch)	0 681 130 ... : 10 cm inclination 0 684 100 ... : 7 cm inclination	Light/dark boundary		J 2
2	Left-hand stop	Light/dark boundary		0 681 130 ... : between 49 and 59 cm 0 684 100 ... : between 46 and 56 cm	J 4
3	Lock-in position (StVZO* Latch)	30 cm inclination	Light/dark boundary		J 8
4	Right-hand stop	Light/dark boundary		between 17 and 24 cm	J 10
5	Lock-in position (StVO* Latch)	10 cm inclination	Light/dark boundary		J 14

* StVZO = FMVSS (in USA), CUR (in GB)

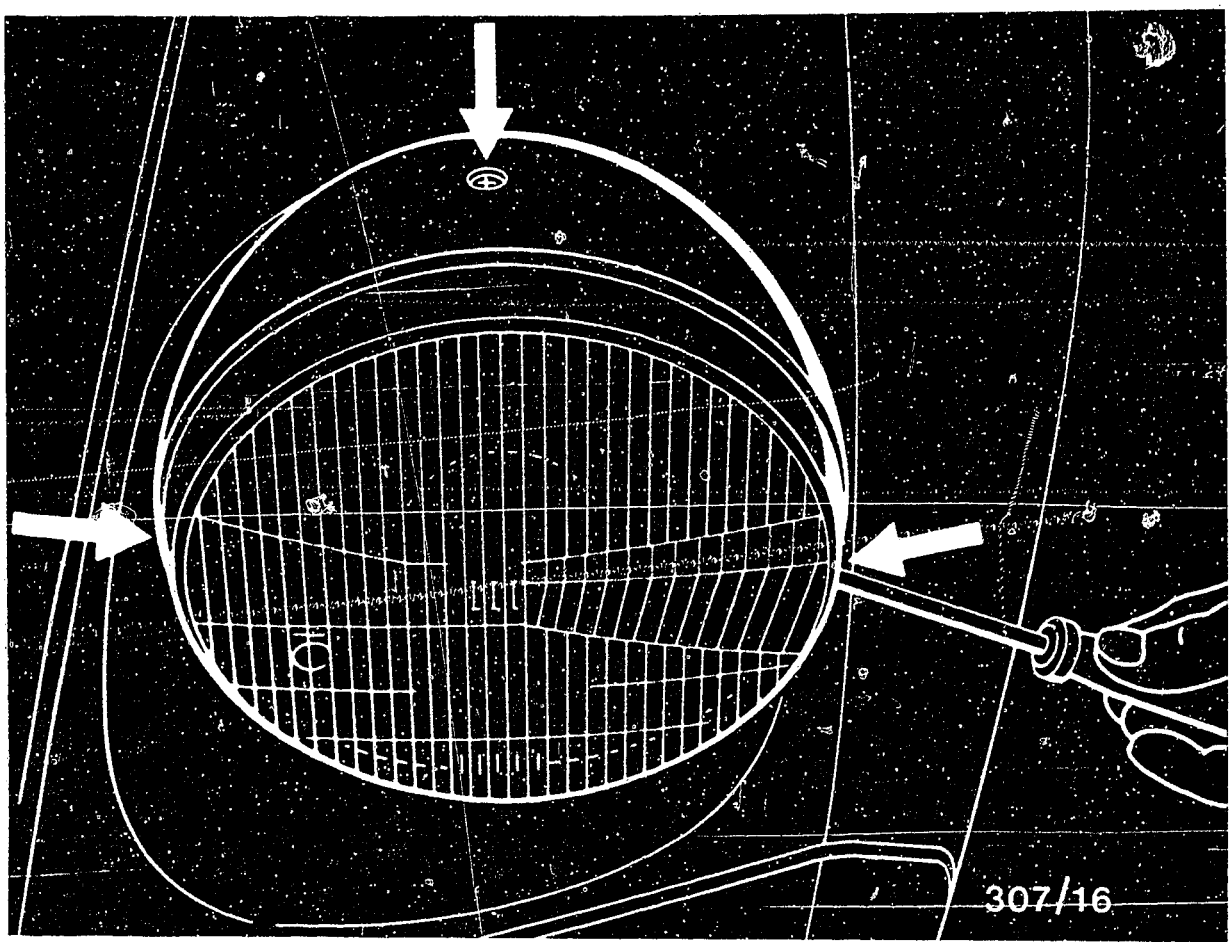
2. General Information

Since August 1977 the Porsche 928 has been equipped with a hydromechanical headlight vertical aim control (headlight vertical aim control system 0 307 550 ..).

The manual adjuster is next to the hand-brake lever.

In order to check the LWR system, the headlamps must be adjusted in individual test steps since the adjustment possibilities on headlight aiming devices are not sufficient for the total adjustment range of the LWR system (upwards and downwards).
In test step 5 the basic setting of the headlights is carried out.

Note: The basic setting refers to the regulations in Germany.
In countries outside Germany the local regulations should be observed.



To adjust the headlamps, it is necessary to remove the headlamp bezel.

To do this, remove recessed head screws (picture, arrows).

3. Test equipment

Headlight aiming device	0 681 130 ...
or	
Headlight aiming device	0 684 100 ...

4. Testing and repairing

Before testing the LWR system, make sure of the following:

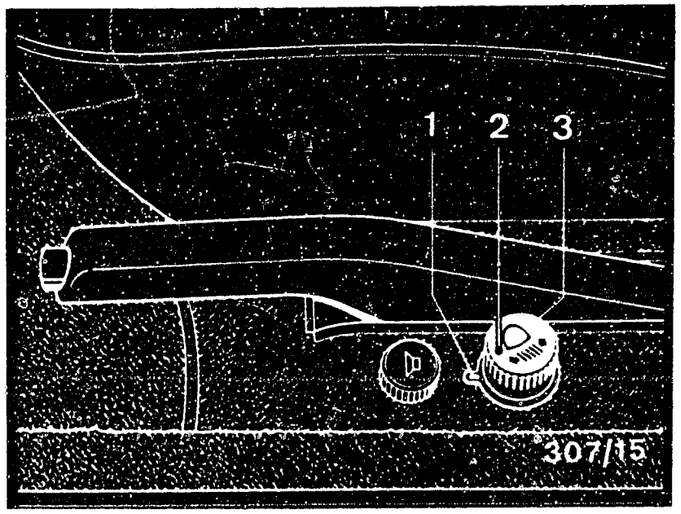
- Tyree pressure O.K.
- Vehicle ready to drive and fuel tank full. Loading 75 kg (driver) (in accordance with StVZO* § 42 Sec. 3).
- Lower beam switched on. (Briefly switch on ignition to expose headlamps).
- Headlight aiming device set up in accordance with operating instructions.

The tests and adjustment operations must be carried out on both headlamps.

Notes
With the detailed testing and trouble-shooting starting on Coordinate B 1, go through the test steps one after the other.
Continue with the trouble-shooting given underneath the test steps only if there is a fault.

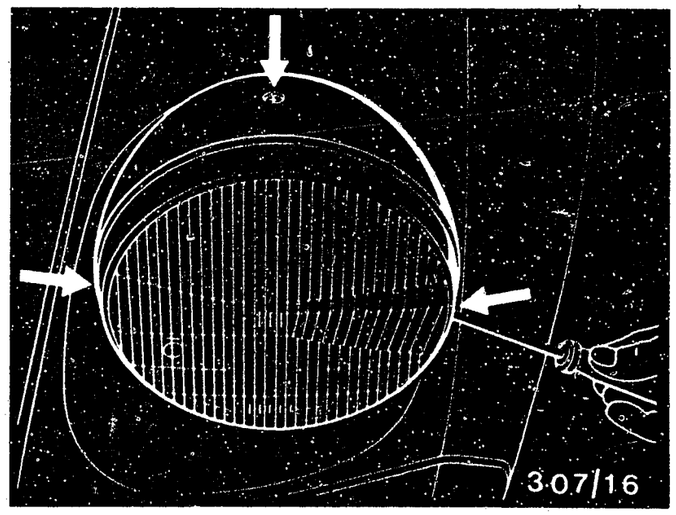
*StVZO = FMVSS (in USA), CUR (in GB)

Test step 1 Operation	Reading	Testing
Measuring equipment: Headlight aiming device 0 681 130 .. 0 684 100 ..		Component: Headlamp
Operation in vehicle: Set manual adjuster to latched position (StVZO*Latch) (Top picture) *StVZO=FMVSS (in USA), CUR (in GB)		Operation: Correct adjustment
Setting on headlight aiming device: Set headlight aiming device 0 681 130 .. to 10 cm inclination 0 684 100 .. to 7 cm inclination		Malfunction: Headlamp not mechanically adjustable
Operation in vehicle: Set headlights to light/dark boundary (bottom illustration)		



Manual adjuster (3) at latched position (StVZO*Latch)
White dot (2) must aline with mark (1) on rose under knob

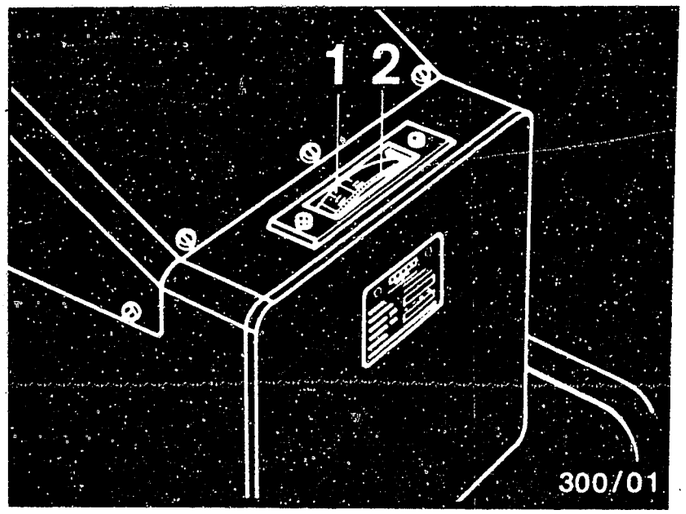
To adjust headlamps, remove headlamp bezel. To do this, remove screws (arrows).



Headlamp not mechanically adjustable:

Check headlamp for damage and replace if necessary.

Test step 2 Operation	Reading	Testing
Measuring equipment: Headlight aiming device 0 681 130 .. (top illustration) 0 684 100 .. (bottom illustration)	On headlight aiming device: Light/dark boundary on 0 681 130 .. between 49 and 59 cm inclination 0 684 100 .. between 46 and 56 cm inclination	Component: LWR system Downward adjustment
Operation in vehicle: Manual adjuster all the way to the left		Operation: Adjustment range up/down
Setting on headlight aiming device: Set to light/dark boundary		Malfunction: Values not reached

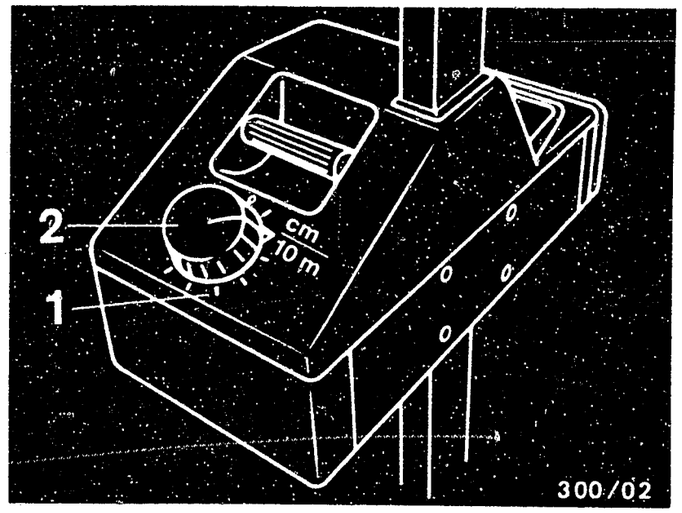


1 = Setting scale
2 = Knurled disc or knob for setting inclination

Headlight adjustment only partially present

Check reflectors for freedom of movement. Test stroke of control elements.

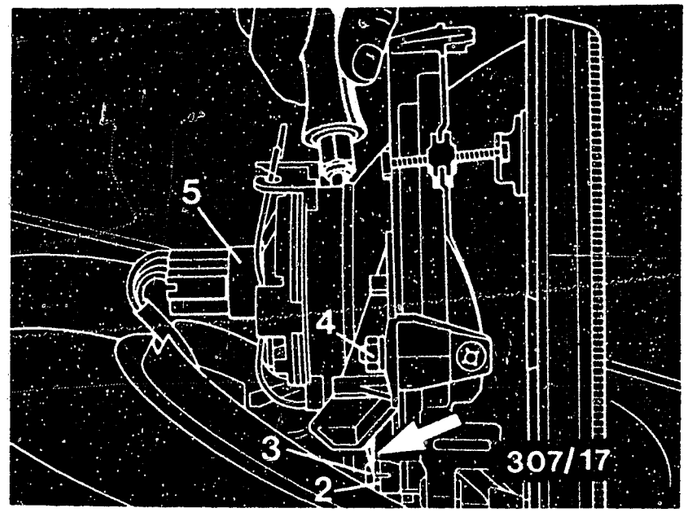
Continued on J13/J14



Trouble-shooting if headlamp adjustment only partially available:

1. Test headlamps for freedom of movement

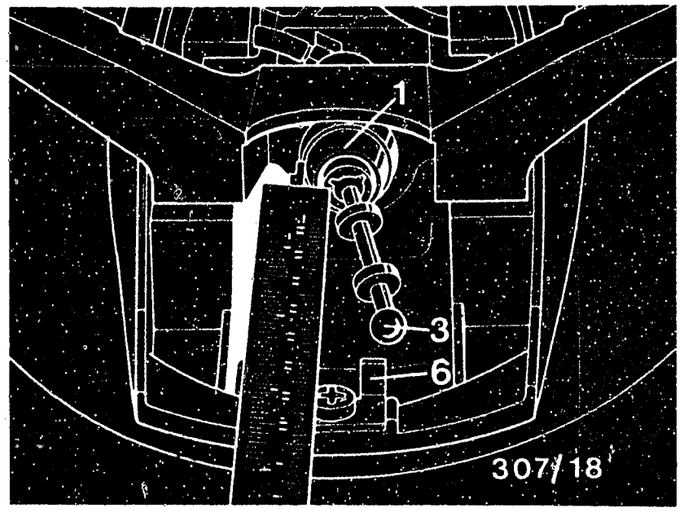
Press retainer (2) (top picture) away from spacer pin (3). Using screwdriver, unhook spacer pin (3) from headlamp. Move headlamp by hand and check for freedom of movement (must not stick).



Test the stroke of the adjustment elements (Centre picture)

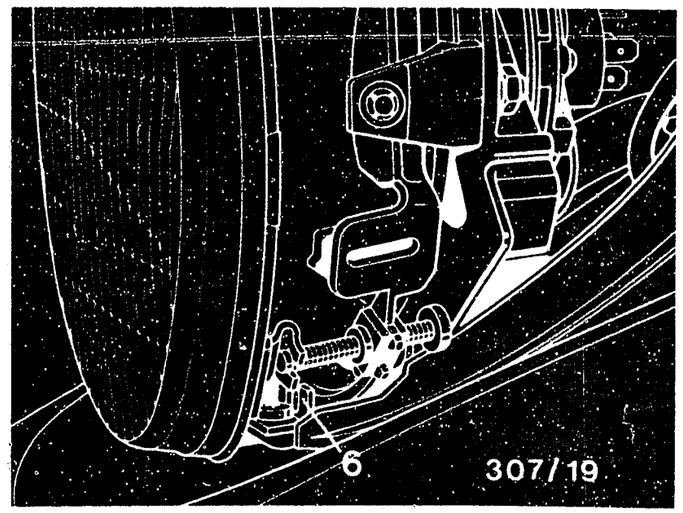
Remove lamp connector (5) (top picture).
Unscrew fastening nuts (4) (top picture) and remove headlamp. Turn rotary knob of manual adjuster to latch position (StVZO latch).
Using sliding caliper, measure projection dimension of piston.
Turn rotary knob to the left as far as it will go and measure the changed projection dimension.
If the difference is less than 3.7 mm, the complete manual adjustment system must be replaced.

Return rotary knob to latch position (StVZO latch) and measure the projection dimension.
Turn rotary knob to the right as far as it will go and measure the changed projection dimension.
If the difference is less than 0.5 mm, the complete manual adjustment system must be replaced.

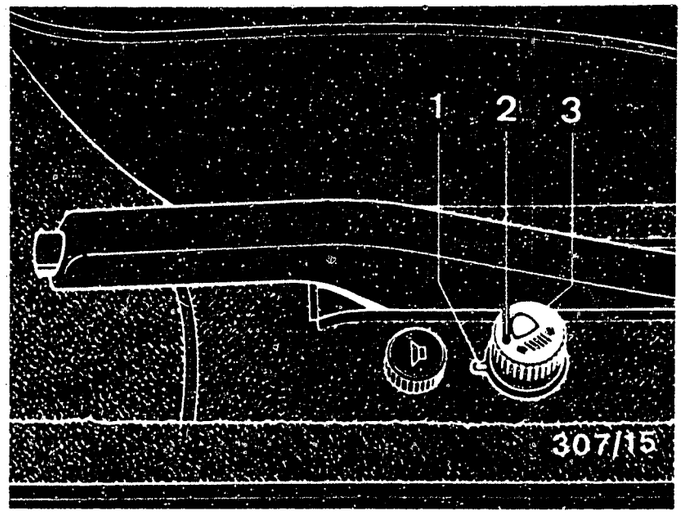


Note:

Before re-installing the headlamps, fit spacer pin retainer.
When installing the headlamps, make sure that the stop bracket (6) (center and bottom pictures) is mounted as in the picture.
If there is no headlamp adjustment at all on one or both headlamps, check whether the spacer pin (3) is latched in position in the headlamp holder or adjustment element (1).



Test step 3 Operation	Reading	Testing
Measuring equipment: Headlight aiming device 0 681 130 .. 0 684 100 ..	On headlight aiming device: Light/dark boundary with 30 cm inclination	Component: Headlamp
Operation in vehicle: Set manual adjuster to latched position (StVZO*Latch) (Top picture) *StVZO=FMVSS (in USA), CUR (in GB)		Operation: Adjustment
Setting on headlight aiming device: Set to 30 cm inclination		Malfunction: Headlamp not mechanically adjustable
Operation in vehicle: Set headlights to light/dark boundary (bottom illustration)		

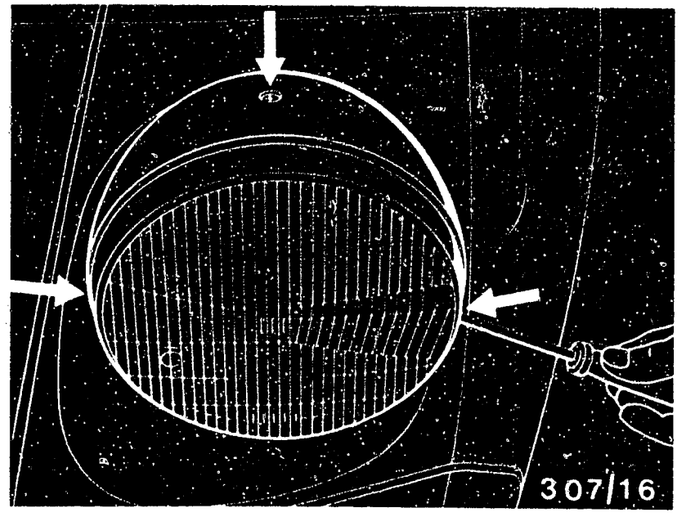


Manual adjuster (3) at latched position (StVZO*Latch). White dot (2) must aline with mark (1) on rose under knob

Headlamp not mechanically adjustable:

Check headlamp for damage and replace if necessary.

To adjust headlamps, remove headlamp bezel. To do this, remove screws (arrows).



Test step 4 Operation	Reading	Testing
Measuring equipment: Headlight aiming device 0 681 130 .. 0 684 100 ..	On headlight aiming device: Light/dark boundary between 17 and 24 cm inclination	Component: LWR system Downward adjustment
Operation in vehicle: Manual adjuster all the way to the right		Operation: Adjustment range up/down
Setting on headlight aiming device: Set to light/dark boundary		Malfunction: Values not reached

Headlight adjustment only partially present

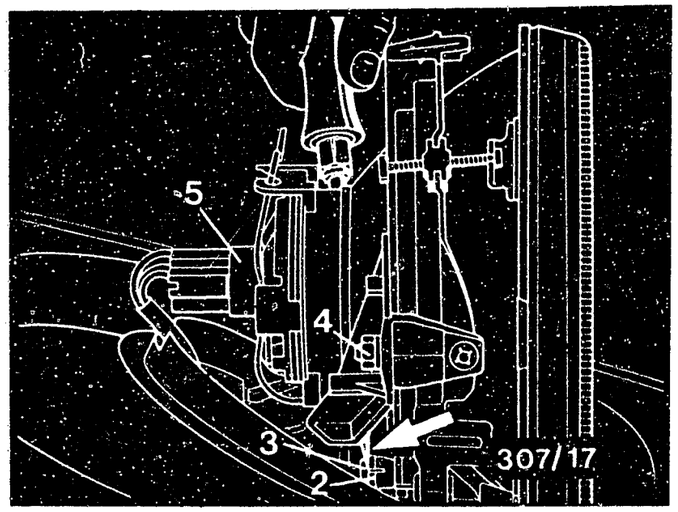
Check reflectors for freedom of movement. Test stroke of control elements.

Continued on J19/J20

Trouble-shooting if headlamp adjustment only partially available:

1. Test headlamps for freedom of movement

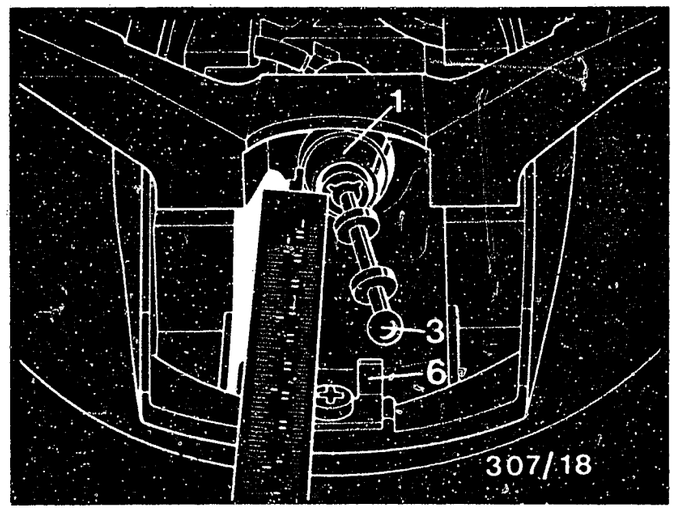
Press retainer (2) (top picture) away from spacer pin (3). Using screwdriver, unhook spacer pin (3) from headlamp. Move headlamp by hand and check for freedom of movement (must not stick).



Test the stroke of the adjustment elements (Centre picture)

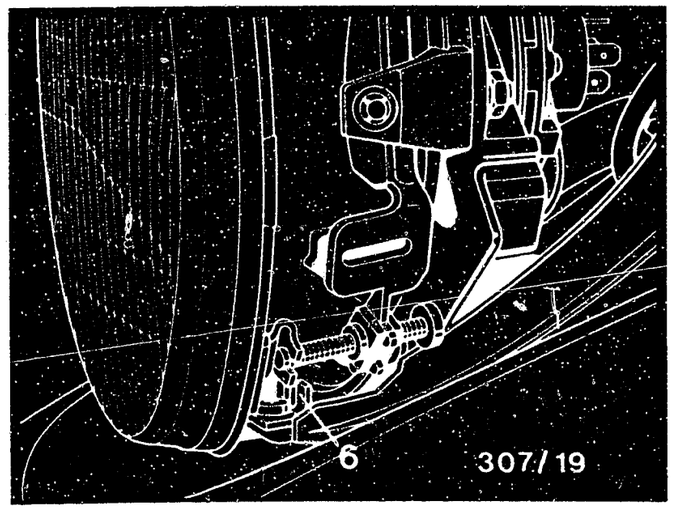
Remove lamp connector (5) (top picture).
Unscrew fastening nuts (4) (top picture) and remove headlamp. Turn rotary knob of manual adjuster to latch position (StVZO latch).
Using sliding caliper, measure projection dimension of piston.
Turn rotary knob to the left as far as it will go and measure the changed projection dimension.
If the difference is less than 3.7 mm, the complete manual adjustment system must be replaced.

Return rotary knob to latch position (StVZO latch) and measure the projection dimension.
Turn rotary knob to the right as far as it will go and measure the changed projection dimension.
If the difference is less than 0.5 mm, the complete manual adjustment system must be replaced.

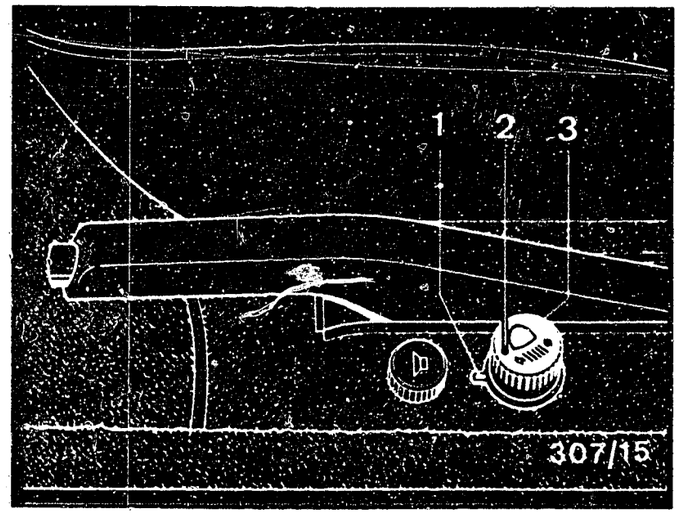


Note:

Before re-installing the headlamps, fit spacer pin retainer.
When installing the headlamps, make sure that the stop bracket (6) (center and bottom pictures) is mounted as in the picture.
If there is no headlamp adjustment at all on one or both headlamps, check whether the spacer pin (3) is latched in position in the headlamp holder or adjustment element (1).



Test step 5 Operation	Reading	Testing
Measuring equipment: Headlight aiming device 0 681 130 .. 0 684 100 ..	On headlight aiming device: Light/dark boundary with 10 cm inclination	Component: Headlamp
Operation in vehicle: Set manual adjuster to latched position (StVZO*Latch) (Top picture) *StVZO=FMVSS (in USA), CUR (in GB)		Operation: Basic setting
Setting on headlight aiming device: Set to 10 cm inclination		Malfunction: ----------
Operation in vehicle: Set headlights to light/dark boundary (bottom illustration)		



Manual adjuster (3) at latched position (StVZO*Latch).
White dot (2) must aline with mark (1) on rose under knob

To adjust headlamps, remove headlamp bezel. To do this, remove screws (arrows.

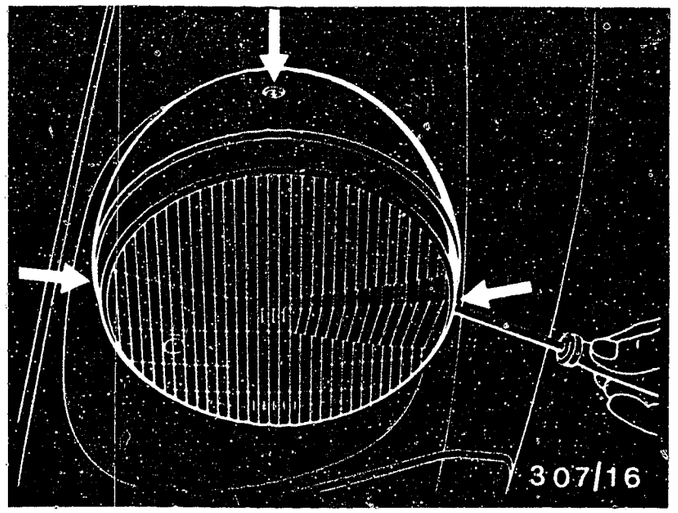


TABLE OF CONTENTS

SPECIAL FEATURES

This microcard contains the trouble-shooting instructions for the diesel fuel-injection system, valid at the time of publication, for the following vehicles:

Renault 9D (1.83 ->), 11D (7.83 ->)

1. Test specifications

1.1	Idle speed:	850 ± 25 min^{-1}
	Fast idle	1150 ± 50 min^{-1}
1.2	Nozzle-opening pressure	130 + 8 bar
1.3	Coordination, pump - engine (F 8 M):	
	Engine position:	1st cylinder at TDC
	Check value:	
	Pump position:	0.63...0.67 mm after BDC
	Setting:	
	Pump position:	0.65 mm after BDC
1.4	Compression:	at least 20 bar
	Max. cylinder deviation:	4 bar

1.5 Cold-start device

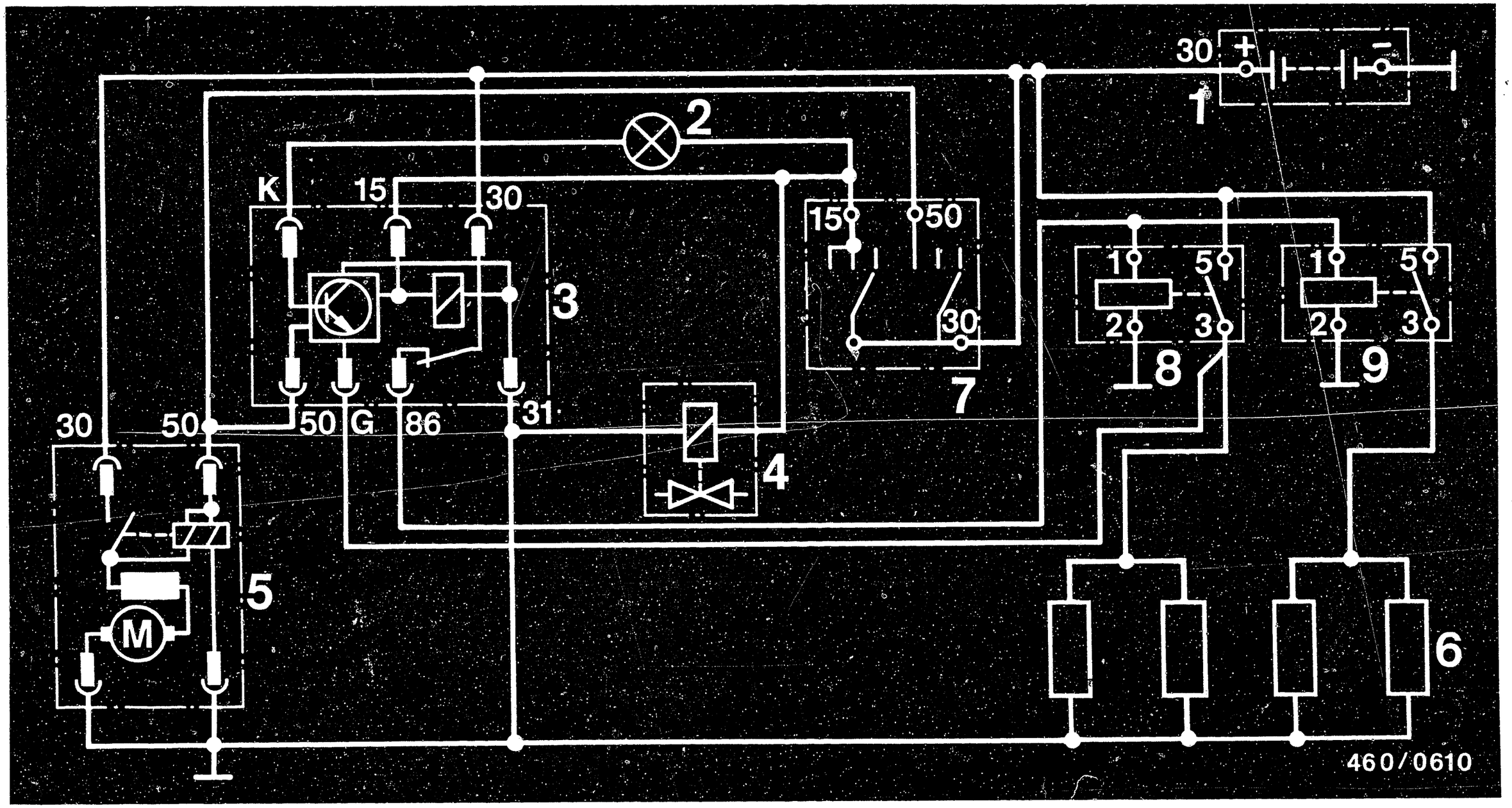
Engine speed	Ambient temperature	Operating time	Thermo-couple (Ri)
above 2000 min^{-1}	above + 35° C	not operating	23 Ω
	+ 20° C	30 s.	
	- 20° C	165 s.	

1.6 Toothed-belt tension

Scale interval	13 ... 14

1.7 Tightening torques

Injection-pump gear (hexagon nut)	50 Nm
Fuel lines	25 Nm
Fastening screws of injection pump	25 Nm
Cylinder-head cover	3 ... 6 Nm
Locking screw	10 Nm
Fastening screws for nozzle-holder assembly	65 ... 75 Nm
Sheathed-element glow plugs	15 ... 30 Nm
Angle bracket of injection pump (fastening screws)	25 Nm
Toothed-belt tensioning roller	40 Nm
Hollow screws, fuel lines	25 Nm
Pulley/Crankshaft	100 Nm



1 = Battery
2 = Glow-plug indicator lamp (12 V 2 W)
3 = Glow-duration unit 0 333 402 006
4 = Solenoid-operated valve
5 = Starting motor
6 = Sheathed-element glow plugs
7 = Glow-plug and starter switch
8 = Power relay
9 = Power relay

2. Terminal diagram of pre-heating system

3. Tools

Description	Part Number	Use
Puller	KDEP 1118	Removing injection-pump gear
Setting mandrel	KDEP 1123	Locking crankshaft
Holding device	KDEP 1147	For locking the pump drive gear
Measuring tool	KDEP 1085	Injection timing

4. Removing injection pump

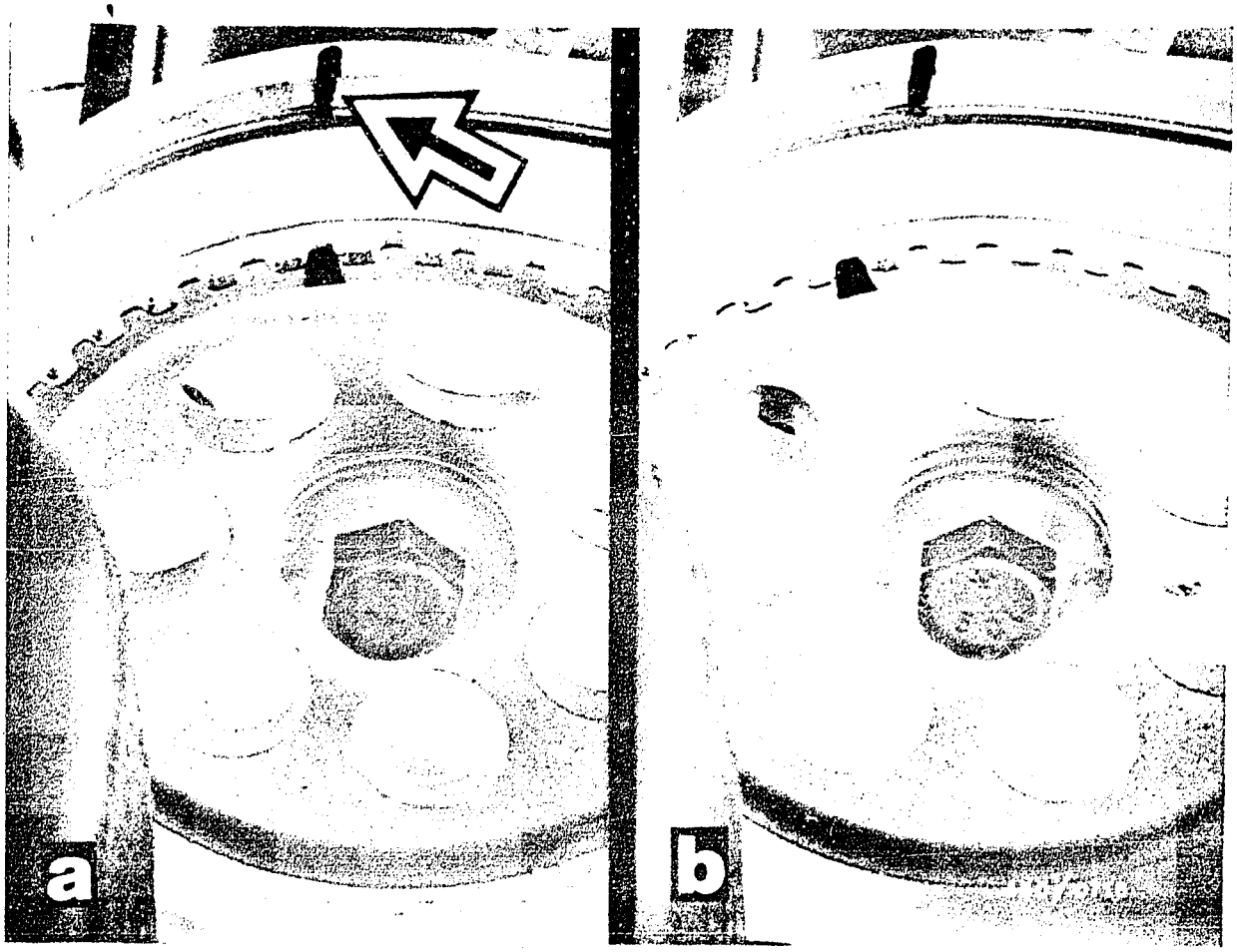
Disconnect negative cable from battery.

Remove toothed-belt protective cover.

Engage 4th gear and jack up right-hand front wheel.

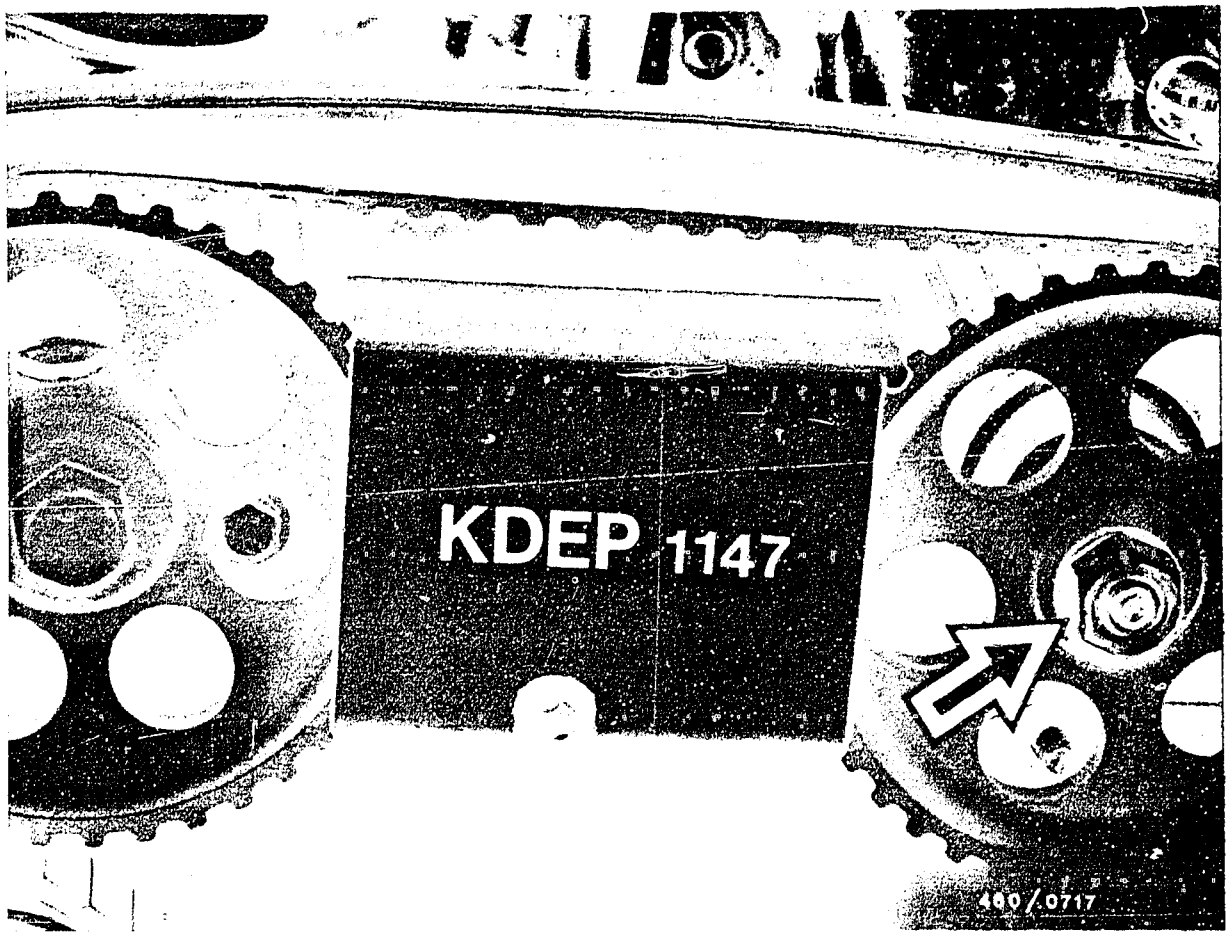
By turning the front wheel, position the piston in cylinder 1 (flywheel end) at TDC (left-hand illustration).

Check position of crankshaft using setting mandrel KDEP 1123 (right-hand picture).



In TDC position, mark the positions of the markings on the camshaft gear and the injection-pump gear on the timing-gear cover (illustration a, arrow).

Then turn the timing gears back one tooth (illustration b).

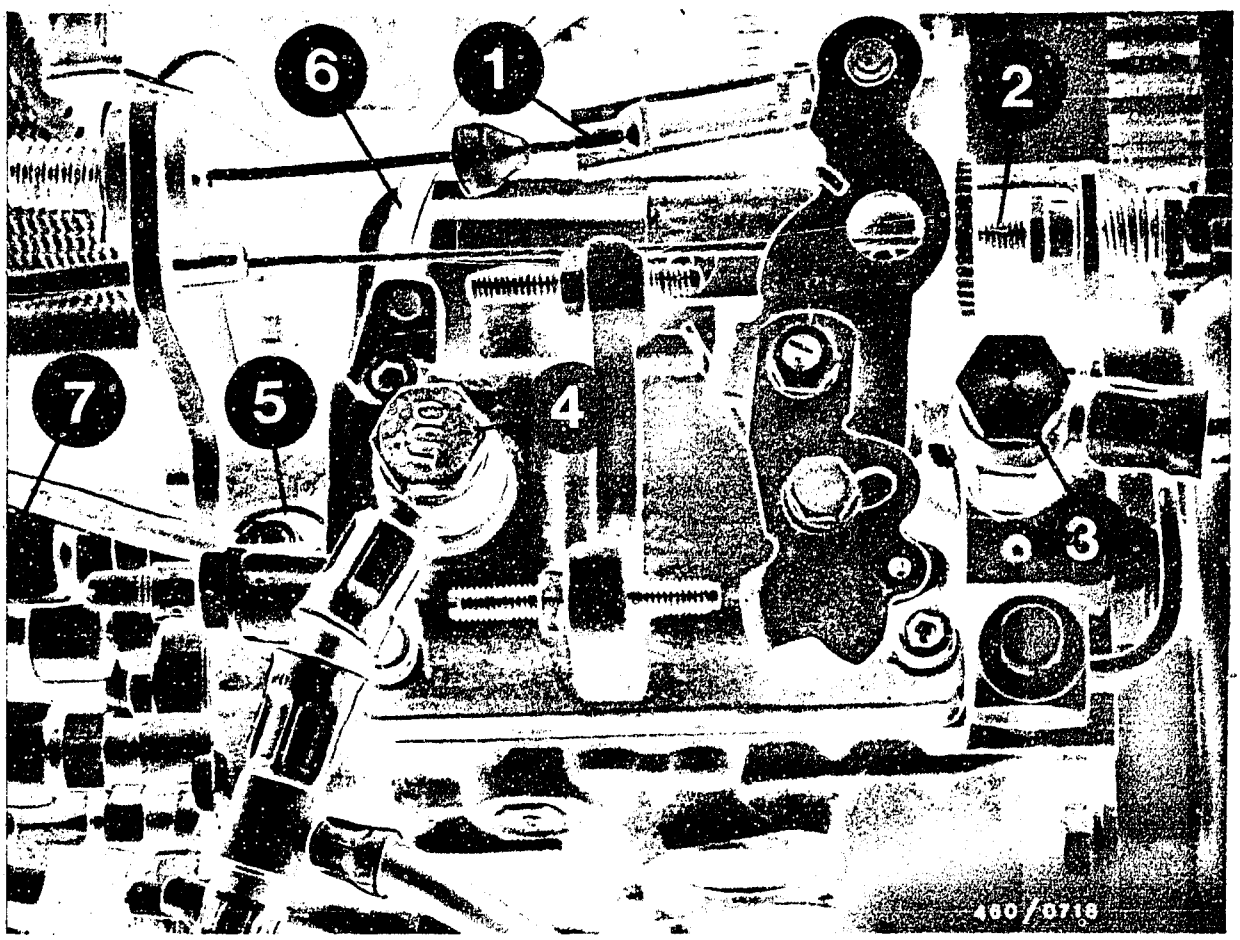


Insert holding device KDEP 1147 between camshaft gear and injection-pump gear (see illustration).

Loosen fastening screw of injection-pump gear (arrow) and screw out approx. 2 rotations.

Loosen injection-pump gear using puller KDEP 1118.

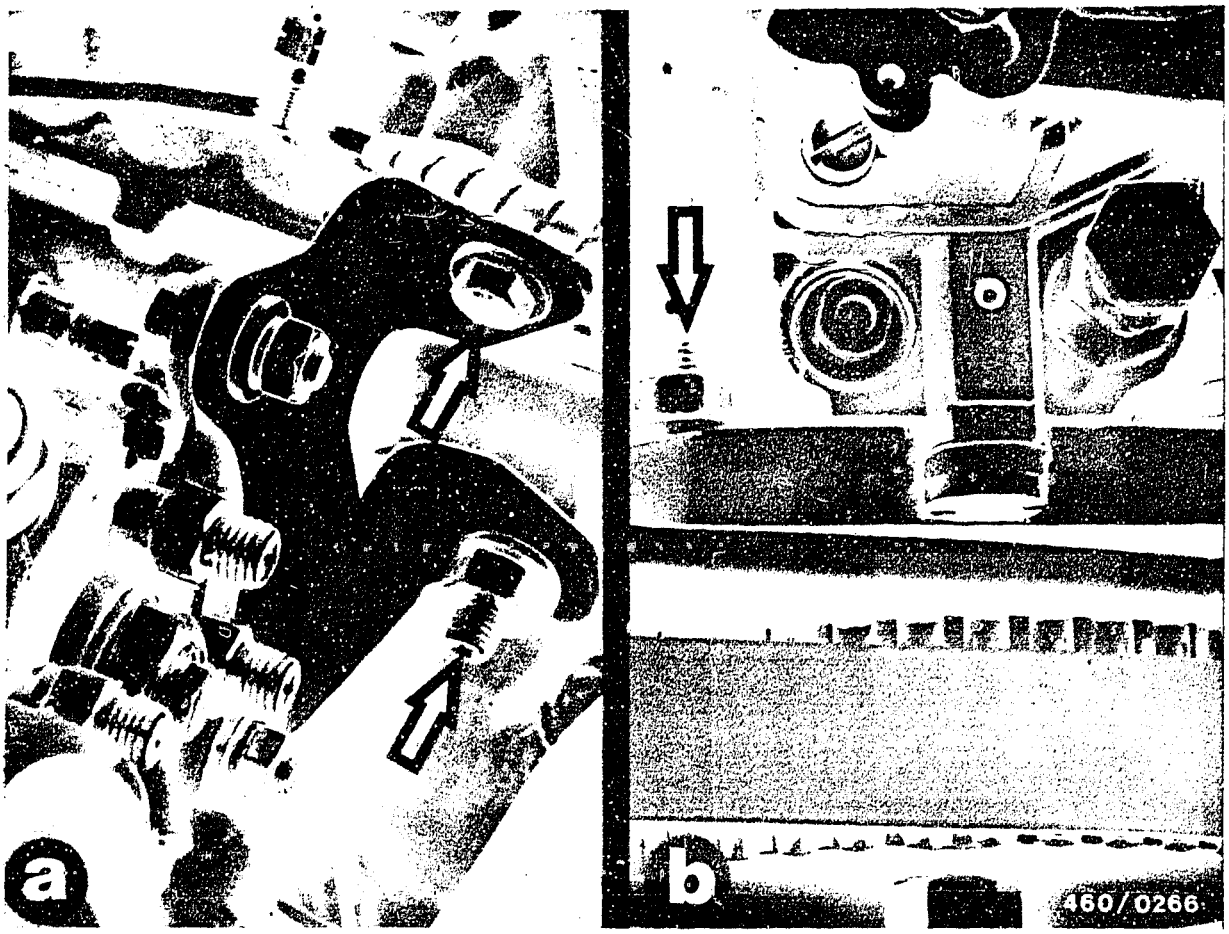
Remove fastening screw and washer from drive shaft of injection pump.



Remove bowden cable at control lever of injection pump (1), bowden cable for increased idle (2), fuel inlet line (3), fuel return line (4), connecting cable for electric shutoff device (3), connecting cable for cold-start device (6) and injection lines (7).

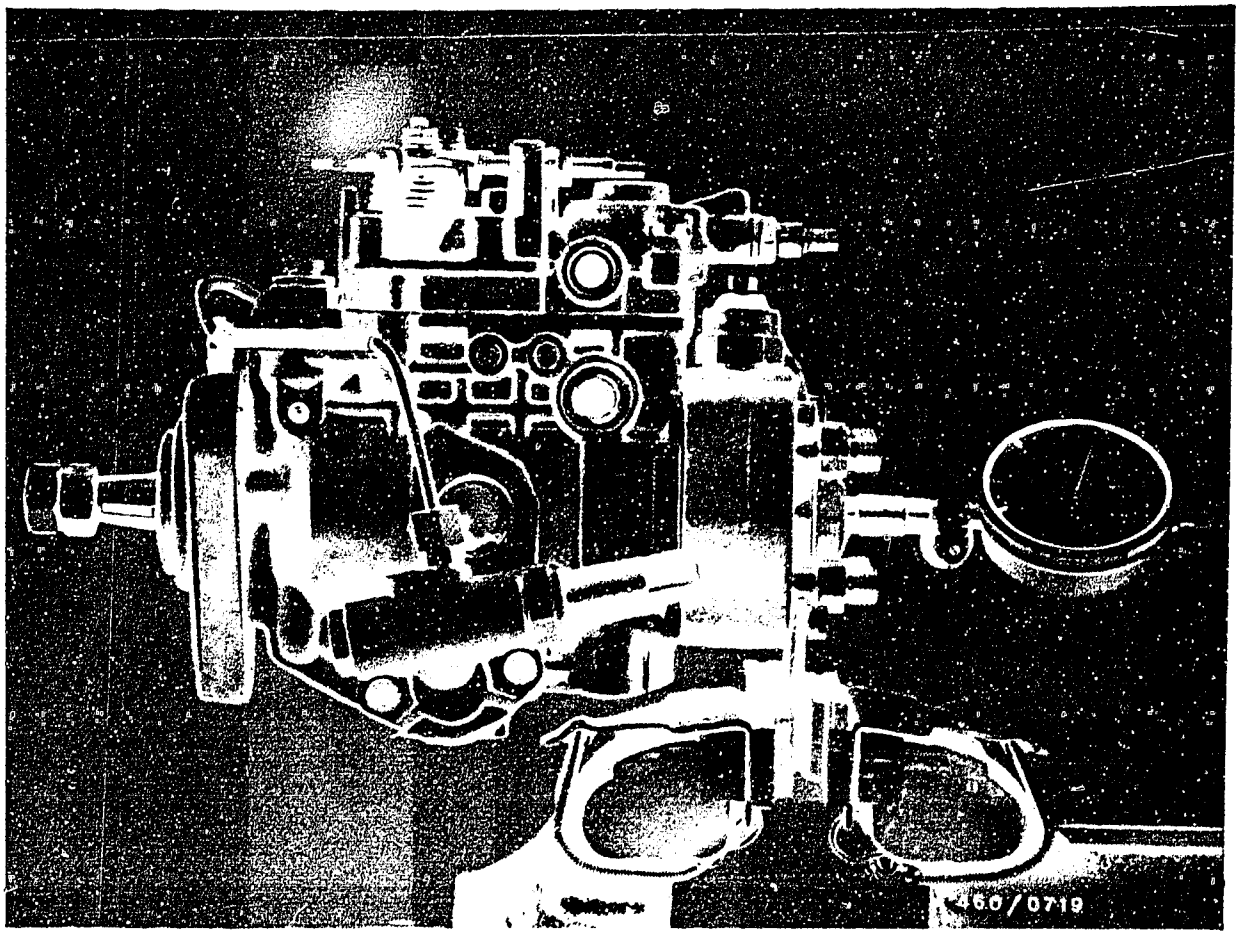
Note:

Prevent the delivery-valve holder from loosening by counterholding.



Unscrew injection pump support bracket fastening screws (arrows, Fig. a).

Remove injection-pump fastening nuts on pump flange and remove injection pump (arrow, Fig. b).



5. Install fuel-injection pump

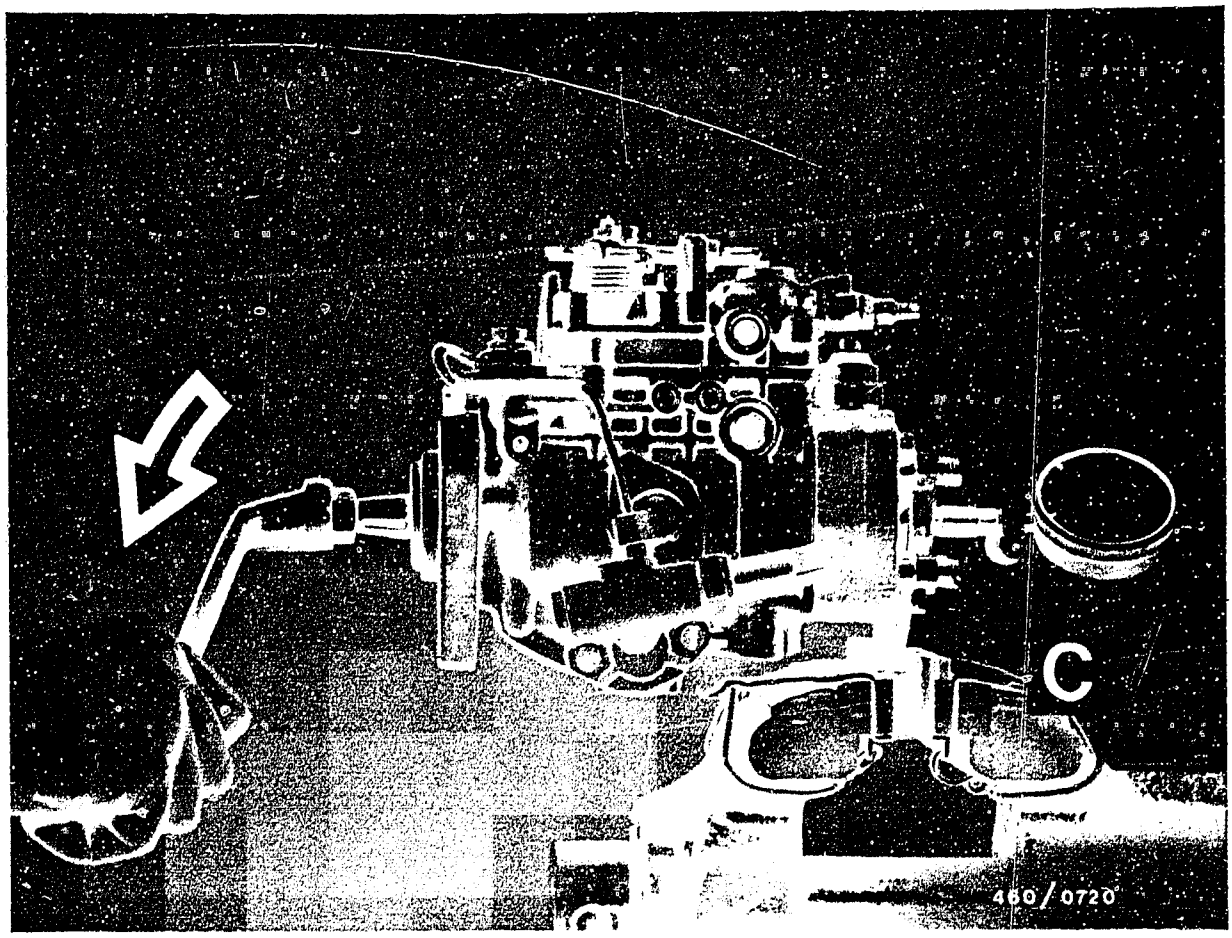
Clamp fuel-injection pump in a vice.

Screw two hexagon nuts onto the injection-pump drive shaft and lock.

Remove injection-pump bleeder screw.

Mount measuring tool KDEP 1085 in the tapped hole of the bleeder screw.

Mount dial indicator 1 687 233 011 with measuring base in measuring tool KDEP 1085 (see illustration).



Turn pump shaft in direction of arrow until the distributor-pump plunger reaches BDC.

In this position, preload dial indicator by 3 mm and set to "0".

Continue to turn drive shaft in direction of arrow until the V-groove (once again with distributor-pump plunger in BDC position) points to outlet "C" (see illustration) of hydraulic head.

Unscrew hexagon nuts (do not turn drive shaft any further).

Insert Woodruff key in groove in drive shaft.

Introduce injection pump into bore in pump drive gear.

Screw on fastening nuts of injection pump by hand.

Mount plain washer and fastening nut of pump drive gear and tighten to 50 Nm.

Remove holding device KDEP 1147.

Turn crankshaft twice in direction of engine rotation.

At TDC of cylinder 1, fix crankshaft using setting mandrel KDEP 1123.

In this position, dial indicator at injection pump must indicate a plunger lift of 0.65 mm after BDC.

If necessary, correct by pivoting the injection pump.

Note:

Poor tensioning of the toothed belt adversely affects the pump setting.

Check toothed-belt tension using belt-tension testing tool KDEP 1121.

Turn the vernier sleeve until the lower edge of the sleeve coincides with the locating mark on the measuring tongue.

Read off measured value.

Set value: Scale interval 13 ... 14

Testing the setting

Remove setting mandrel KDEP 1123.

Turn crankshaft 1 3/4 turns in direction of rotation.

Check whether dial indicator is at "0" with distributor-pump plunger in BDC position.

Turn crankshaft further as far as TDC position (engine) and lock with setting mandrel KDEP 1123.

The dial indicator on the injection pump must indicate a piston stroke of 0.63 ... 0.67 mm.

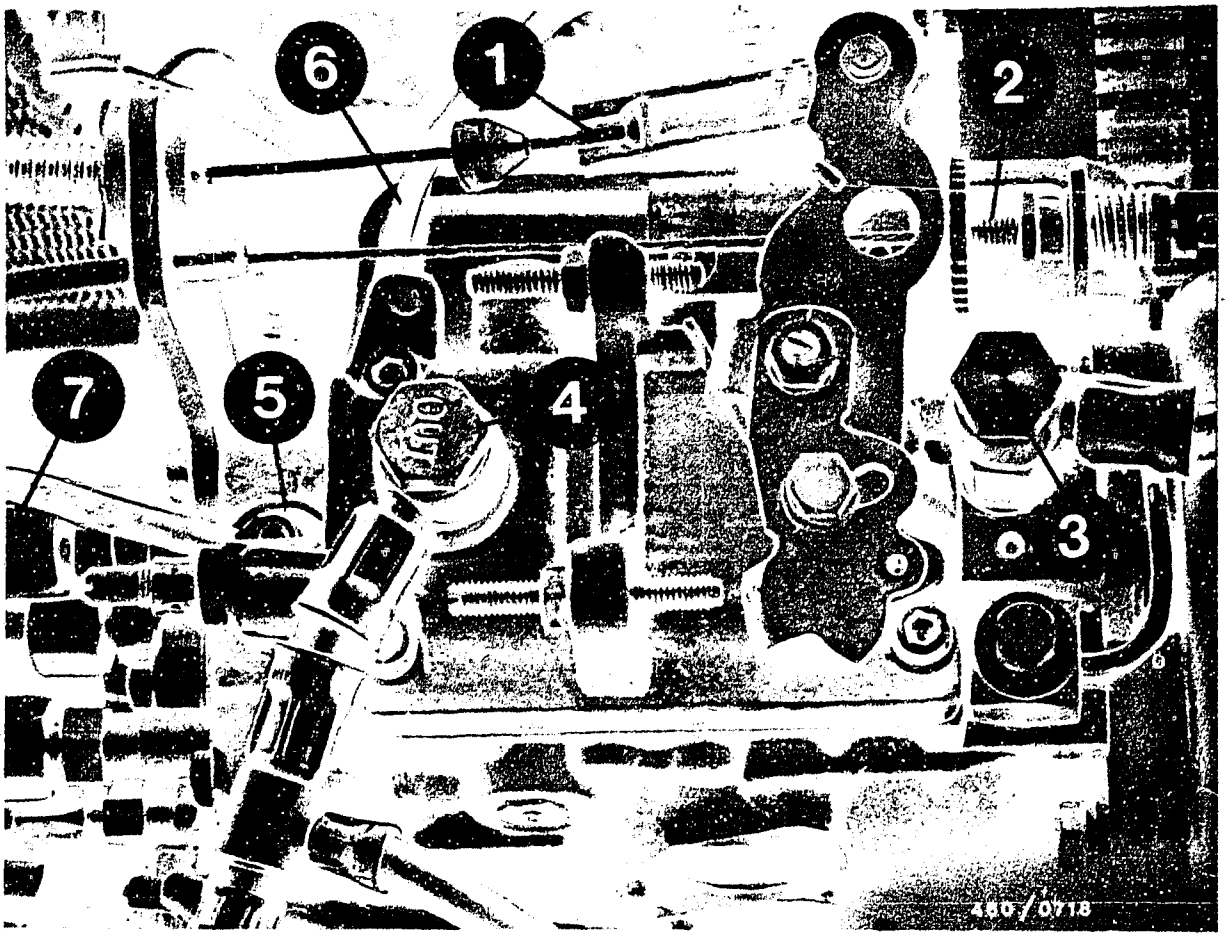
Remove setting mandrel KDEP 1123.

Tighten injection-pump fastening nuts to 25 Nm.

Remove measuring tool KDEP 1085 with dial indicator and fit bleeder screw with new copper seal ring.

Mount support bracket on injection-pump hydraulic head and tighten fastening screws.

Mount toothed-belt protective cover.



Assemble bowden cable at control lever of injection pump (1), bowden cable for increased idle (2), fuel inlet line (3), fuel return line (4), connecting cable for electric shutoff device (5), connecting cable for cold-start device (6) and injection lines (7). (Prevent the delivery-valve holder from turning by counterholding.)

Connect negative cable to battery.

Note:
The hollow screws of the fuel-inlet and fuel-return lines must not be mixed up.
The hollow screw of the return is equipped with restriction bores and is identified at the screw head by the marking "Out".

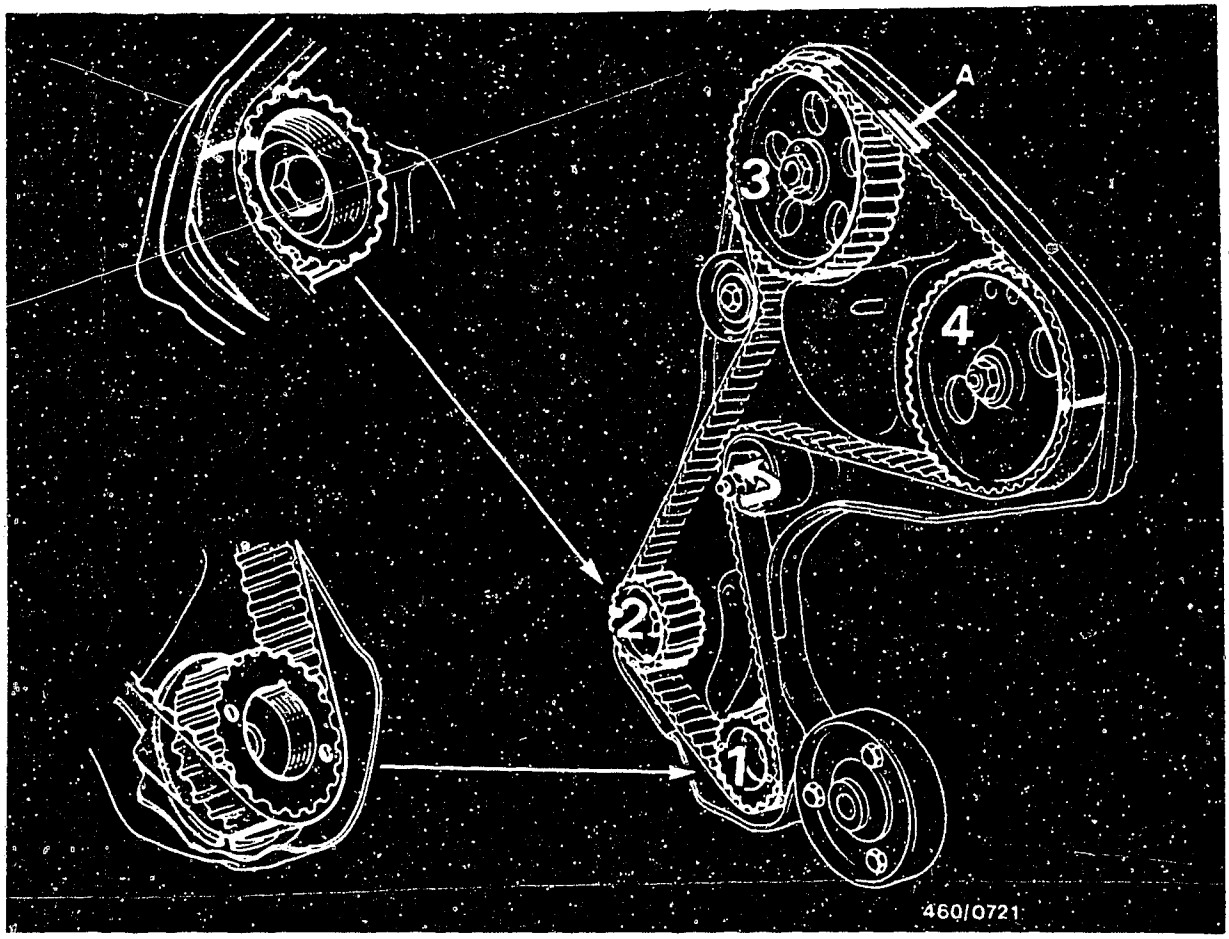
6. Testing and adjusting engine timimg

6.1 Testing engine timing

Remove cylinder-head cover and toothed-belt protective cover.

Turn crankshaft to TDC of cylinder 1 (cylinder 4 at valve overlap) and fix using setting mandrel KDEP 1123.

Remove V-belt from generator and pulley of crankshaft.



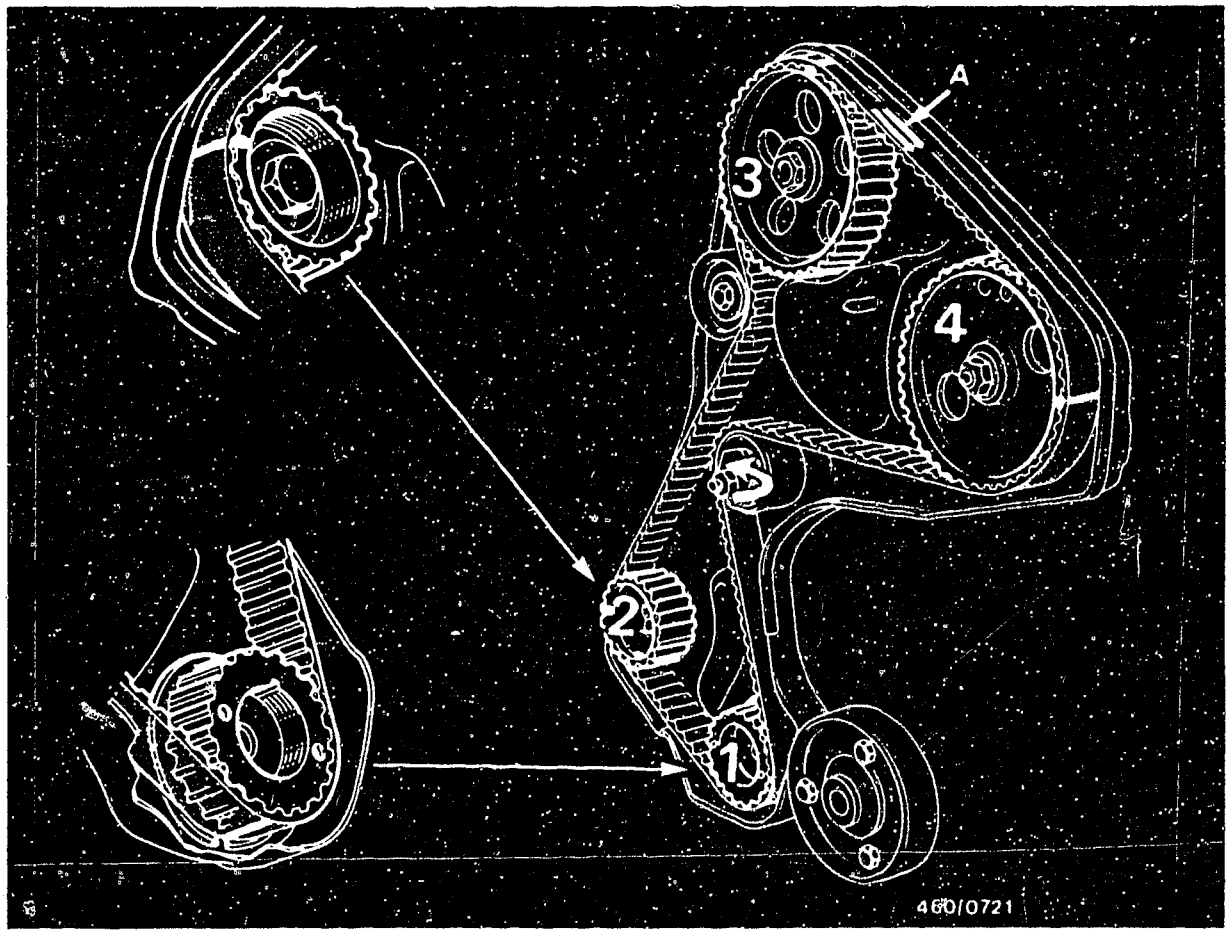
Check number of teeth on toothed belt between the markings on the toothed gears:

18 teeth between toothed gears 1 and 2

47 teeth between toothed gears 2 and 3

29 teeth between toothed gears 3 and 4

If these numbers of teeth are not obtained, the engine timing must be adjusted accordingly.



6.2 Adjusting engine timing

Loosen toothed-belt tensioning roller and remove toothed belt.

Check whether setting mandrel KDEP 1123 is locking crankshaft at TDC of cylinder 1.

Align locating marks on toothed belt with those on the timing gears.

Position toothed belt over toothed wheels in sequence 1 - 2 - 3 and 4.

Arrow markings on toothed belt (arrow A) indicate the direction of assembly and must be positioned between camshaft gear and injection-pump gear.

Remove setting mandrel KDEP 1123.

By turning the tensioning roller counterclockwise, adjust toothed belt to scale interval 13 ... 14 in accordance with belt-tension testing tool KDEP 1121.

Tighten fastening nut of tensioning roller to 40 Nm.

Turn crankshaft of engine twice.

Fix crankshaft at TDC of cylinder 1 using setting mandrel.

Check toothed-belt tension and number of teeth on toothed belt between the markings of the toothed gears once again.

18 teeth between toothed gears 1 and 2

47 teeth between toothed gears 2 and 3

29 teeth between toothed gears 3 and 4

Remove setting mandrel.

Tighten pulley of crankshaft to 100 Nm.

Position V-belt of generator and tension. ..

Assemble cylinder-head cover and toothed-belt protective cover.

TABLE OF CONTENTS

1. Special features

- K-Jetronic
- Pre-supply pump in the fuel tank.
- Series resistor and electric fuel pump starting relay
- Fuel distributor with pressure relief valve
- Air-flow sensor with angle sensor (potentiometer) to display fuel consumption.
- Warm-up regulator for disengaged full-load enrichment.
- Rigid steel tubing fuel-injection lines.
- Connecting parts kit KDJE-P100/12 is needed to connect the pressure tester KDJE-P100 to the warm-up regulator inlet.
- Vehicles in the model for Sweden and Switzerland are equipped with exhaust gas recirculation and secondary air intake.
- Thermoswitch +45°C for exhaust gas recirculation.
- Non-return valves and noise muffler for the secondary air intake.
- After 11.1984, vehicles in the model for Europe have idle speed control.
- Note:
  The K-Jetronic in the Renault R25 V6 is essentially the same as that in the Renault R30 TX.
  Similar SIS repair instructions:
  Microfiche card REN-01/J1

2. Test specifications

Test step

2.1 Electric fuel pump

0 580 254 937
0 580 254 984

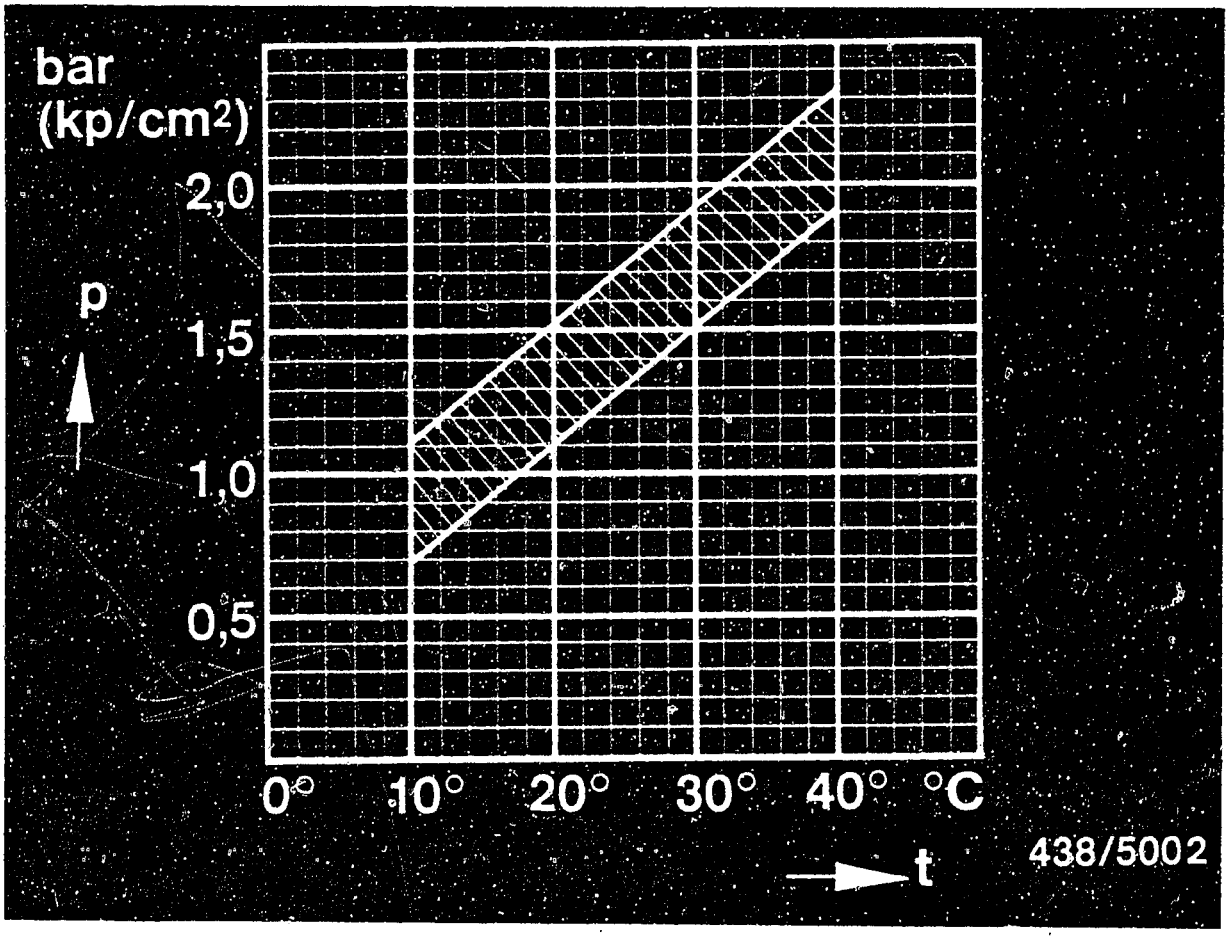
- Fuel delivery: min. 950 cm^3/30s
- Terminal voltage: min. 11.5 V under load
- Pre-supply pump pressure: min. 0.1 bar

2.2 Fuel distributor

- Primary pressure*:

Part number	Checking value	Setting value:
0 438 100 092	4.7...5.4 bar (4.8...5.5 kp/cm^2)	4.9...5.1 bar (5.0...5.2 kp/cm^2)
0 438 100 149	5.2...5.9 bar (5.3...6.0 kp/cm^2)	5.4...5.6 bar (5.5...5.7 kp/cm^2)

*Gauge pressure



p = Control pressure (gauge pressure)
t = Ambient temperature

2.3 Warm-up regulator 0 438 140 133, ... 154

Model for disengaged full-load enrichment.

- Delivery for the control pressure circuit: 160...240 cm³/min.

- "Cold" control pressure

Connect up the vacuum pump to the intake manifold connection of the warm-up regulator for testing.

- Setting value: 400...600 mbar (300...450 mmHg)

Test step	
• Control pressure "warm" *	
Warm-up regulator (Version for separate full-load enrichment)	
• Test with atmospheric pressure (without vacuum):	
0 438 140 133	3.0...3.4 bar (3.1...3.5 kp/cm²)
0 438 140 154	2.55...2.95 bar (2.65...3.05 kp/cm²)
• For testing, connect vacuum pump to intake-manifold connection of warm-up regulator.	
Setting values: 400...600 mbar (300...450 mmHg):	
0 438 140 133 0 438 140 154	3.6...4.0 bar (3.7...4.1 kp/cm²)
• Leak test on full-load diaphragm Max. allowable pressure drop from setting value:	100 mbar (75mmHg) /15s

* Gauge pressure

Test step		
2.4 Fuel accumulator		
• Leak test Min. pressure:	after 10 min	after 20 min
0 438 170 029	2.7 bar* (2.8 kp/cm²)*	2.6 bar* (2.7 kp/cm²)*
0 438 170 054	3.2 bar (3.3 kp/cm²)	3.0 bar (3.1 kp/cm²)
2.5 Injection valve		
Part number 0 437 502 010		
• Opening pressure:	3.0...4.1 bar* (3.1...4.2 kp/cm²)*	
• Leak test not below 2.8 bar:	No drop may fall within 25s.	
Part number 0 437 502 035		
• Opening pressure:	3.7...4.8 bar* (3.8...4.9 kp/cm²)*	
• Leak test not below 3.5 bar:	No drop may fall within 25s.	

* Gauge pressure

Test step

2.6 Fuel distributor — 0 438 100 092, ... 149

- Comparative measurement of fuel deliveries:

	Setting point	max. allowable delivery
Idle	6.0 cm^3/min.	6.6 cm^3/min.
Part load	40.0 cm^2/min.	43.0 cm^3/min.
Full load	155.0 cm^3/min.	170.0 cm^3/min.
This delivery must be obtained at least at each outlet.		

2.7 Thermo-time switch (Non-Bosch product)

- Resistance measurement between

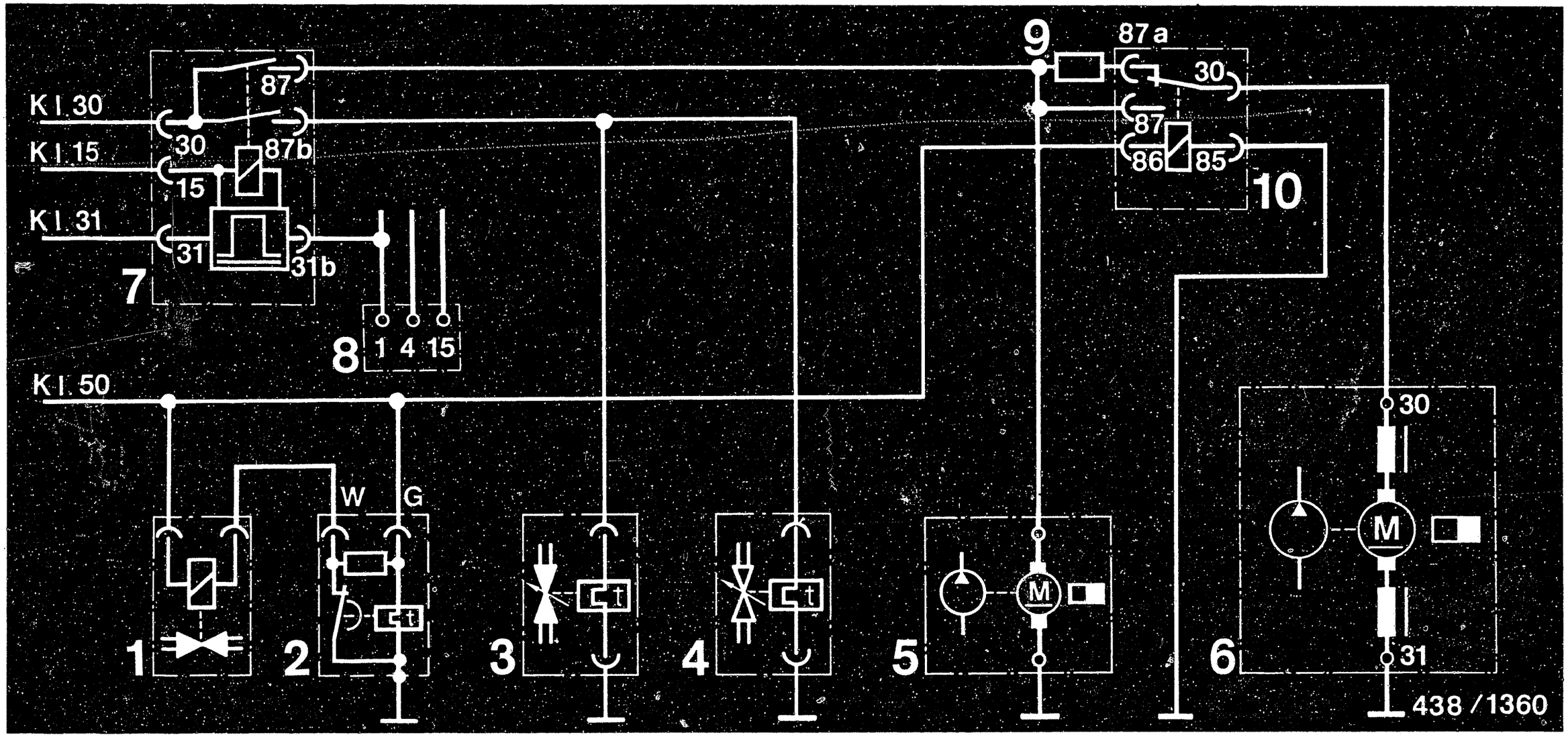
at temperature below °C	above °C	Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and "W"
+30		25...40 Ω	0 Ω	25...40 Ω
	+40	50...80 Ω	100...160 Ω	50...80 Ω

2.8 Potentiometer on air-flow sensor

Total resistance	3000 ...	5000 Ω
Idle resistance	500 ...	900 Ω
Full-load resistance	3500 ...	6000 Ω

Test step	Test specifications
2.9 Idle actuator	
• Internal electrical resistance of each coil: at + 15°...+30°C	17...25 Ω
at ca. +80°C	21...30 Ω
2.10 Idle adjustment*	
• Idle speed	
Manual transmissions (Europe)	850...950 min^{-1}
Automatic transmissions (Europe)	700...800 min^{-1}
Automatic transmissions (Sweden, Switzerland)	850...950 min^{-1}
• CO-level	
Europe	0.5...1.5 vol. %
Sweden, Switzerland	2.0...2.5 vol. %
• Idle speed control	
Engine speed at -20°C	approx. 1100 min^{-1}
Engine speed warm, with air conditioner	approx. 1075 min^{-1}
On/off ratios:	
minimum	.. 26%
at idle speed	28... 30%
maximum, "cold"	90%
maximum, "warm"	70%

* To adjust or check idle speed: switch off the air conditioner. Engine at normal operating temperature, oil temperature approx. +80°C. The radiator fan must not be running when making adjustments. Disengage the secondary air intake and the exhaust gas recirculation (if these are there).



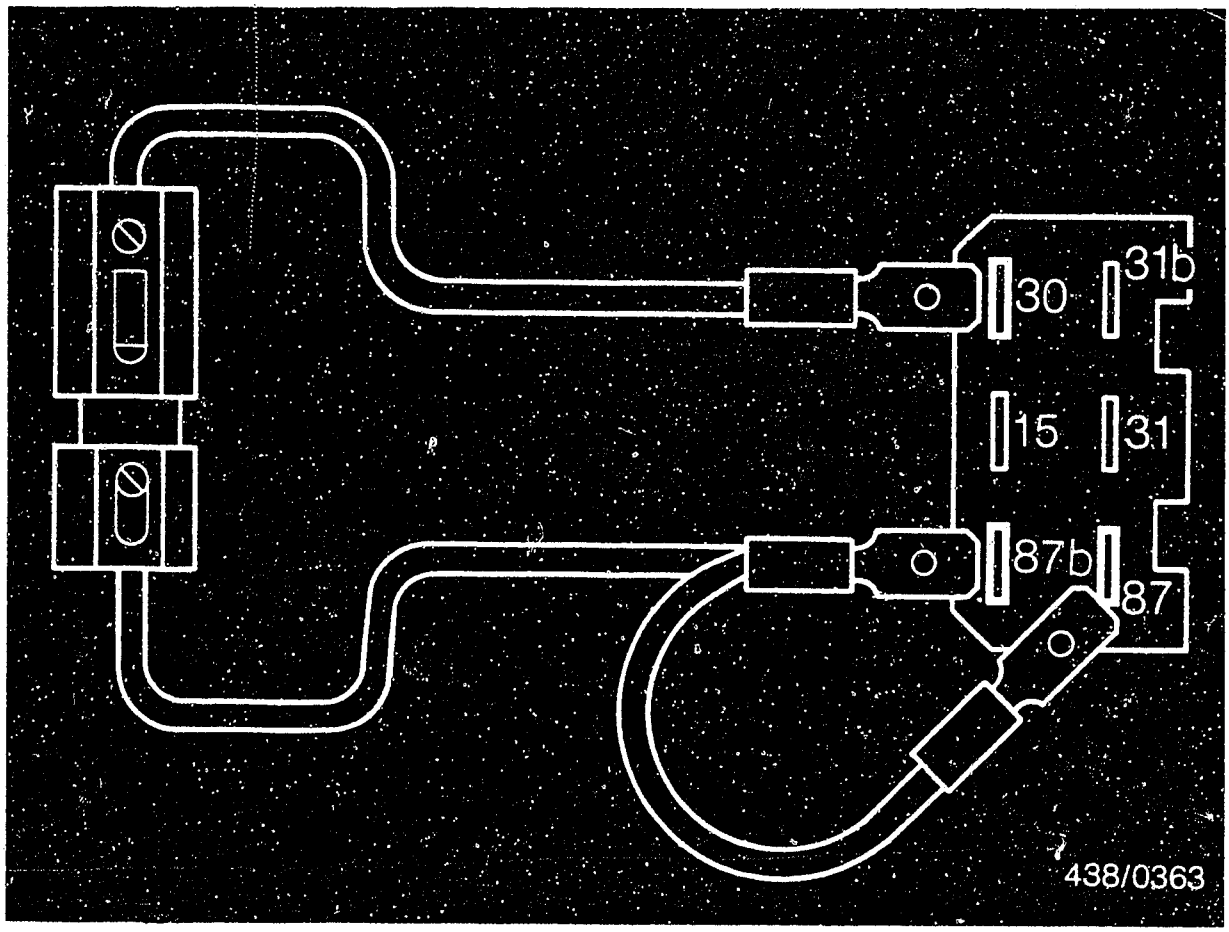
1 = Starting valve
2 = Thermotime switch
3 = Warm-up regulator
4 = Auxiliary-air device, up to 10.1984
5 = In-tank pre-supply pump
6 = Electric fuel pump
7 = Electronic relay
8 = Ignition coil
9 = Series resistor
10 = Pump starting relay

Kl. = Term.

3. Electrical safety circuit

3.1 Wiring diagram

The safety circuit works with an electronic relay that is triggered from Terminal 1 of the ignition coil.

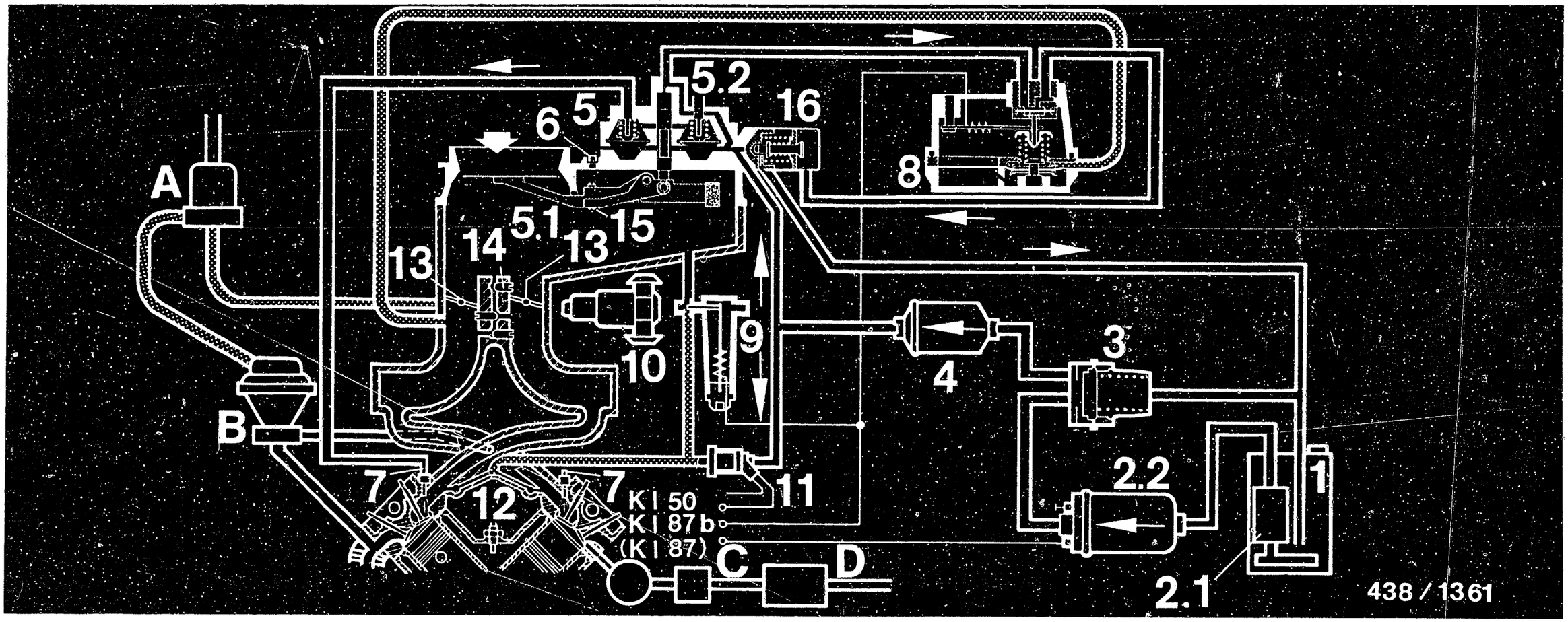


3.2 Jumping the electrical safety circuit for testing

Pull the electronic relay out of the socket.
Using a double jumper, connect contacts 87 and 87b with contact 30 in the socket.
Use a 1.5 mm² connecting lead with a fuse element and a 16 Amp fuse.
In this way, the electric fuel pump, the pre-supply pump, the warm-up regulator, and the auxiliary-air device are supplied with battery voltage.

CAUTION!

Never deflect the air-flow sensor plate while the electric fuel pump is running (press it down), because that results in fuel being injected via the fuel-injection valves.
A subsequent activation of the starting motor can then cause extremely serious damage to the engine!



4. Diagram of fuel lines

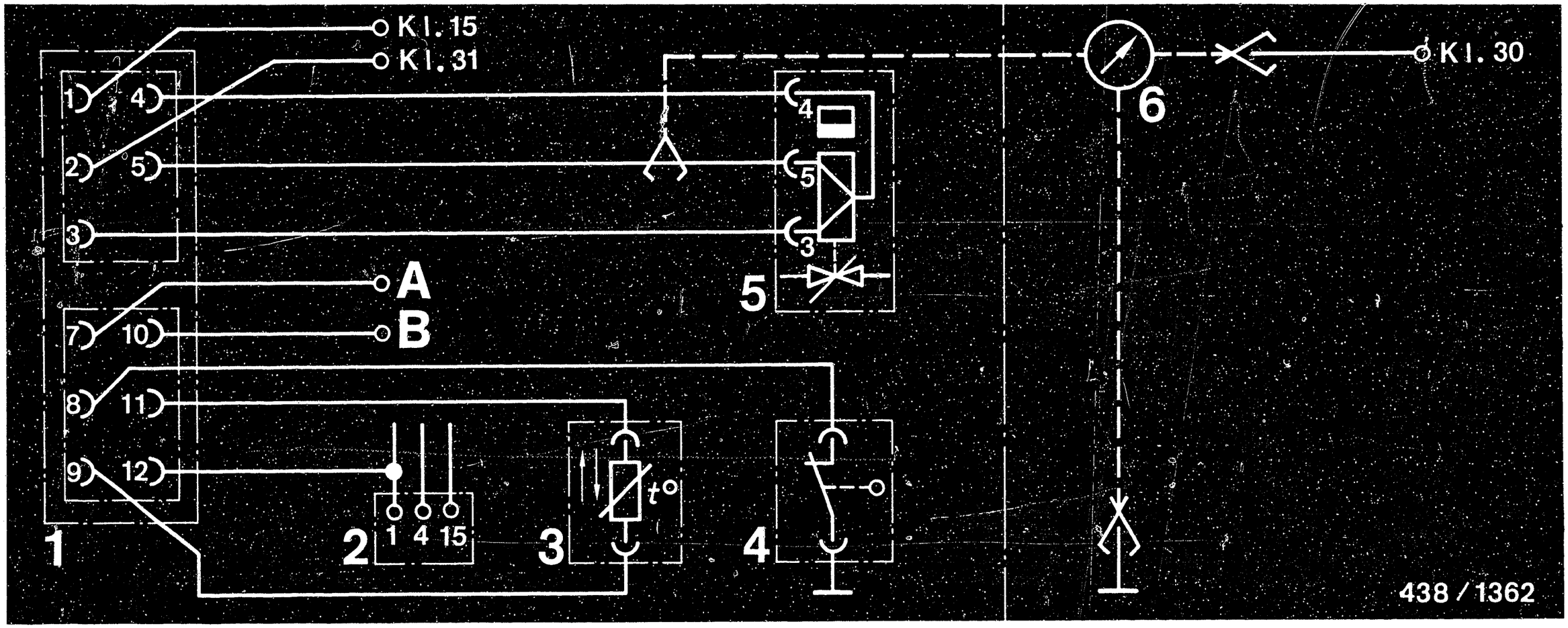
Fuel lines

Intake-manifold pressure lines

1 = Fuel tank
2.1 = Pre-supply pump
2.2 = Electric fuel pump
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Air-flow sensor
5.2 = Fuel distributor
6 = Anti-tamper cap
7 = Injection valve
8 = Warm-up regulator
9 = Auxiliary-air device, up to 10.84
10 = Idle actuator, as of 11.84
11 = Start valve
12 = Thermo-time switch
13 = Throttle valves
14 = Idle-speed screw (bypass)
15 = Idle-mixture-adjusting screw
16 = Primary-pressure regulator with push valve

On Sweden and Switzerland versions only

A = Solenoid-operated valve
B = Exhaust-gas recirculation valve
C = Non-return valve
D = Noise damper



1 = Idle controller (control unit)
2 = Ignition coil
3 = Engine-temperature sensor
4 = Throttle-valve idle switch
5 = Idle actuator
6 = Lambda closed-loop tester KDJE-P 600
A = Air conditioner
B = Test pin

5. Idle-speed control as of 11.1984

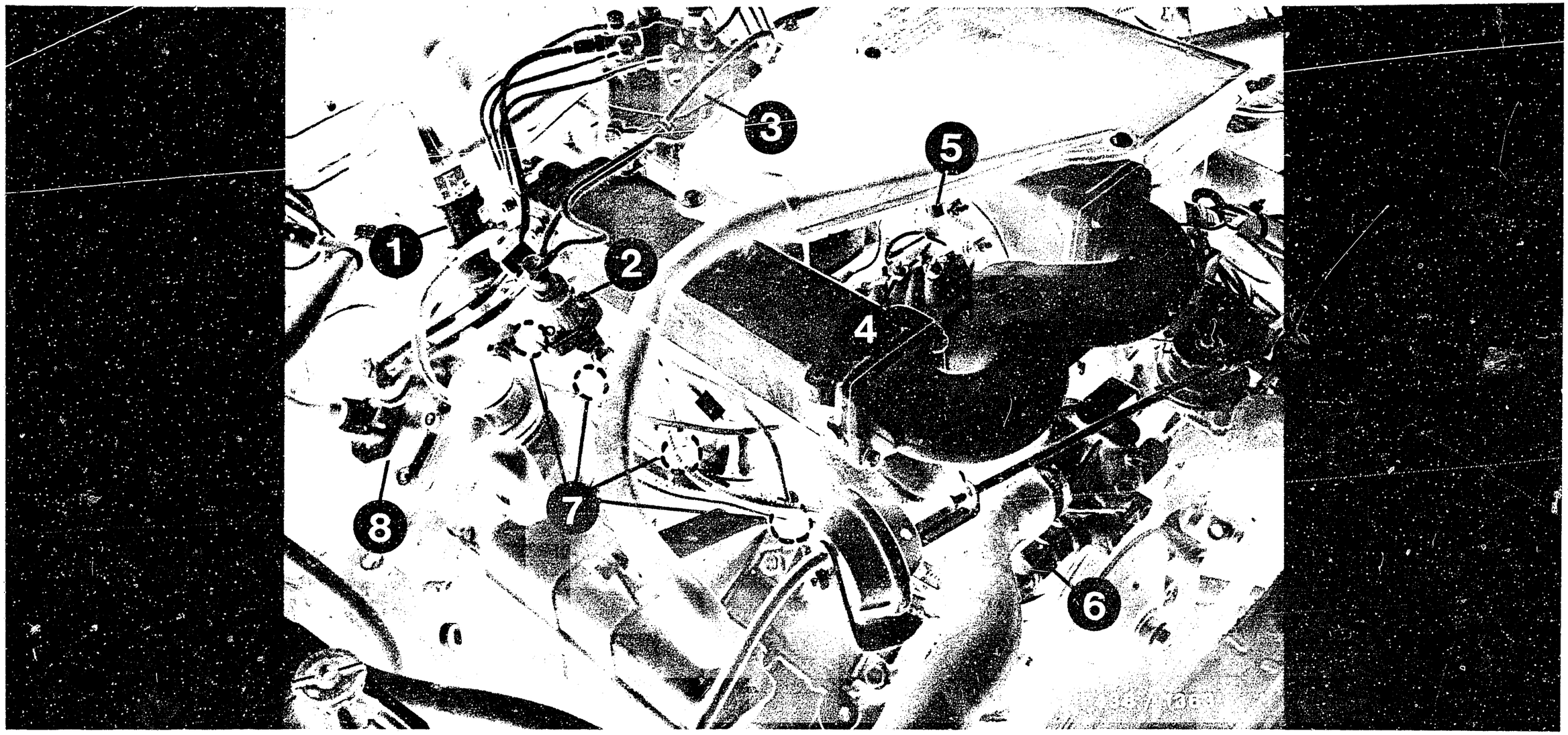
The idle speed is regulated by the idle controller and the idle actuator.
Instead of the auxiliary-air device, the idle actuator is in the air bypass around the throttle valve.
To measure the on/off ratios, connect lambda closed-loop tester KDJE-P 600 and press button "IR" (100%).

6. General safety instructions for work on the K-Jetronic

- Never deflect (depress) the air-flow sensor plate with the electric fuel pump operating since fuel will be injected through the injection valves.
  Subsequent operation of the starting motor may lead to serious engine damage.

- When testing the injection valves with a valve tester, note the regulations on test media.
  Never test with normal gasoline or other easily inflammable liquids.
  Even when using test gasoline, follow the local safety regulations.

- Leak test on engine intake system only with permissible leak-detector spray (e.g. Gypoflex).
  Do not use any easily inflammable liquids.
  Follow the local safety regulations.



1 = Idle actuator
2 = Start valve
3 = Mixture-control unit
4 = Idle-speed adjusting screws
5 = Idle switch
6 = Thermo-time switch
7 = Injection valves
8 = Warm-up regulator

7. Installation position of individual components

7.1 Arrangement of components on engine

7.2 Further components

In the engine compartment

- The fuel filter is under the brake master cylinder.
- The temperature sensor is screwed into the coolant pipe under the air inlet tubes.
- The idle controller (2x6-pin control unit) is mounted on the left-hand inner spray protector. A cover cap protects against splashwater.

On the floor of the vehicle

- Electric fuel pump and fuel accumulator are located on the underside of the vehicle in front of the right-hand rear wheel.

Before replacing any of these components, always thoroughly clean the connections.
Pinch off intake hose of electric fuel pump before loosening so that no fuel can escape (e.g. using hose clamper W 157 from Matra).

TABLE OF CONTENTS

SPECIAL FEATURES

This microcard contains the trouble-shooting instructions for the diesel fuel-injection system on the following vehicles current at the time of writing:

Renault R 25 D, R 25 D-Turbo (1.84->)

1. Test specifications

1.1	Idle speed:	
	R 25 D	700 ... 800 min^{-1}
	R 25 D-Turbo	700 ... 750 min^{-1}
1.2	Nozzle-opening pressure:	130 + 8 bar
1.3	Pump - engine coordination	
	Engine position:	1rst cylinder at TDC
	Inspection value:	
	Pump position:	0.68...0.72 mm after BDC
	Setting value:	
	Pump position:	0.70 mm after BDC
1.4	Compression:	20 ... 30 bar
1.5	Charge-air pressure:	0.6 bar $\pm$ 0.025

1.6 Toothed-belt tension

Scalar value	14 ... 15

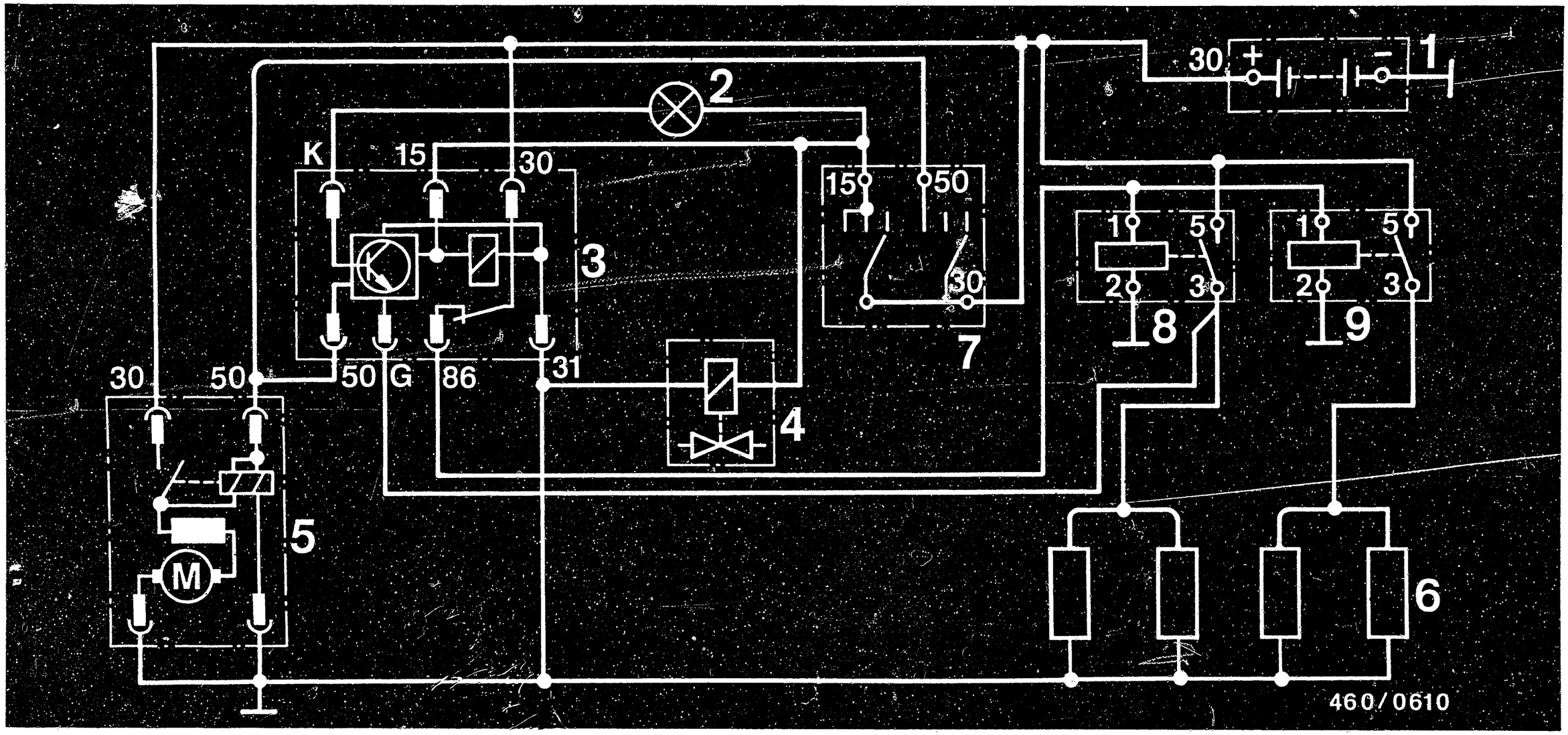
1.7 Tightening torques

Fuel-injection pump fastening screws	25 Nm
Injection-pump gear (hexagon nut)	50 Nm
Nozzle-holder assembly	17 Nm
Fuel lines	25 Nm
Screw plug	10 Nm
Injection-pump support bracket (fastening screws)	25 Nm
Sheathed-element glow plugs	40 Nm

● Note:
The engine in the Renault R 25 D, R 25 D-Turbo essentially corresponds to that of the Renault R 20 D, R 20 D-Turbo. Similar SIS repair instructions: REN-500 microcard.

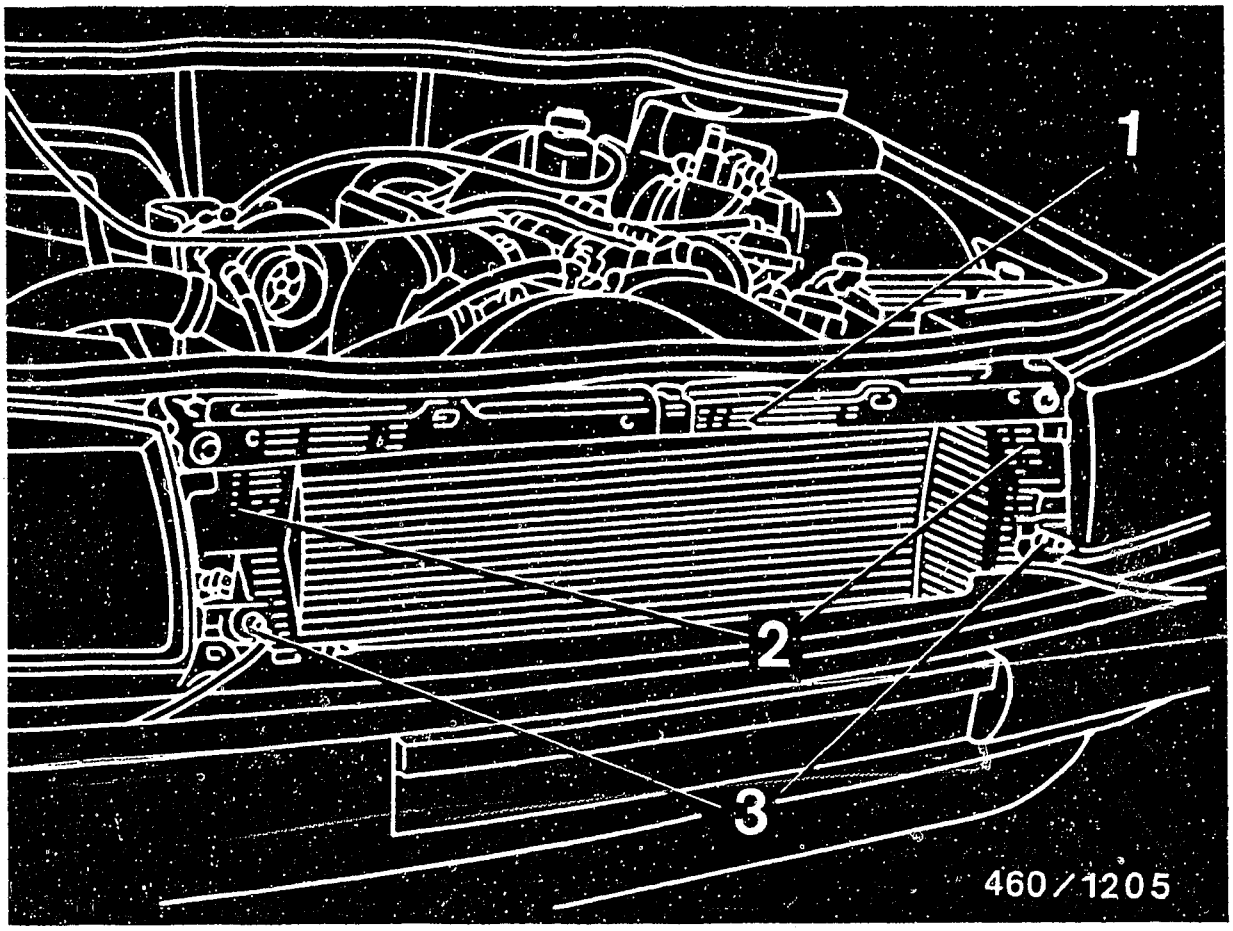
2. Test equipment and tools

Description	Part Number	Use
Puller	KDEP 1118	Removing injection-pump gear
Setting mandrel	KDEP 1123	Locking crankshaft
Holding device	KDEP 1124	For locking the pump drive gear
Toothed-belt tester	KDEP 1121	Testing tension of toothed belt
Box wrench	KDEP 1115	Loosening/tightening injection lines
Pressure tester or pressure gauge 0 ... 1.6 bar	KDJE-P 100 e.g. Wika No. 4184	Testing charge-air pressure
Measuring tool	KDEP 1085	Injection timing
Mini dial indicator 1 / 100 mm divisions	Commercially available e.g. Hahn & Kolb 7000 Stuttgart Part No. 33 003 with adapter KDEP 1127	Injection timing



1 = Battery
2 = Glow-plug indicator lamp (12 V 2 W)
3 = Glow-duration unit
4 = Solenoid-operated valve
5 = Starting motor
6 = Sheathed-element glow plugs
7 = Glow-plug and starter switch
8 = Power relay
9 = Power relay

3. Terminal diagram of pre-heating system in Renault 25 D, 25 D-Turbo



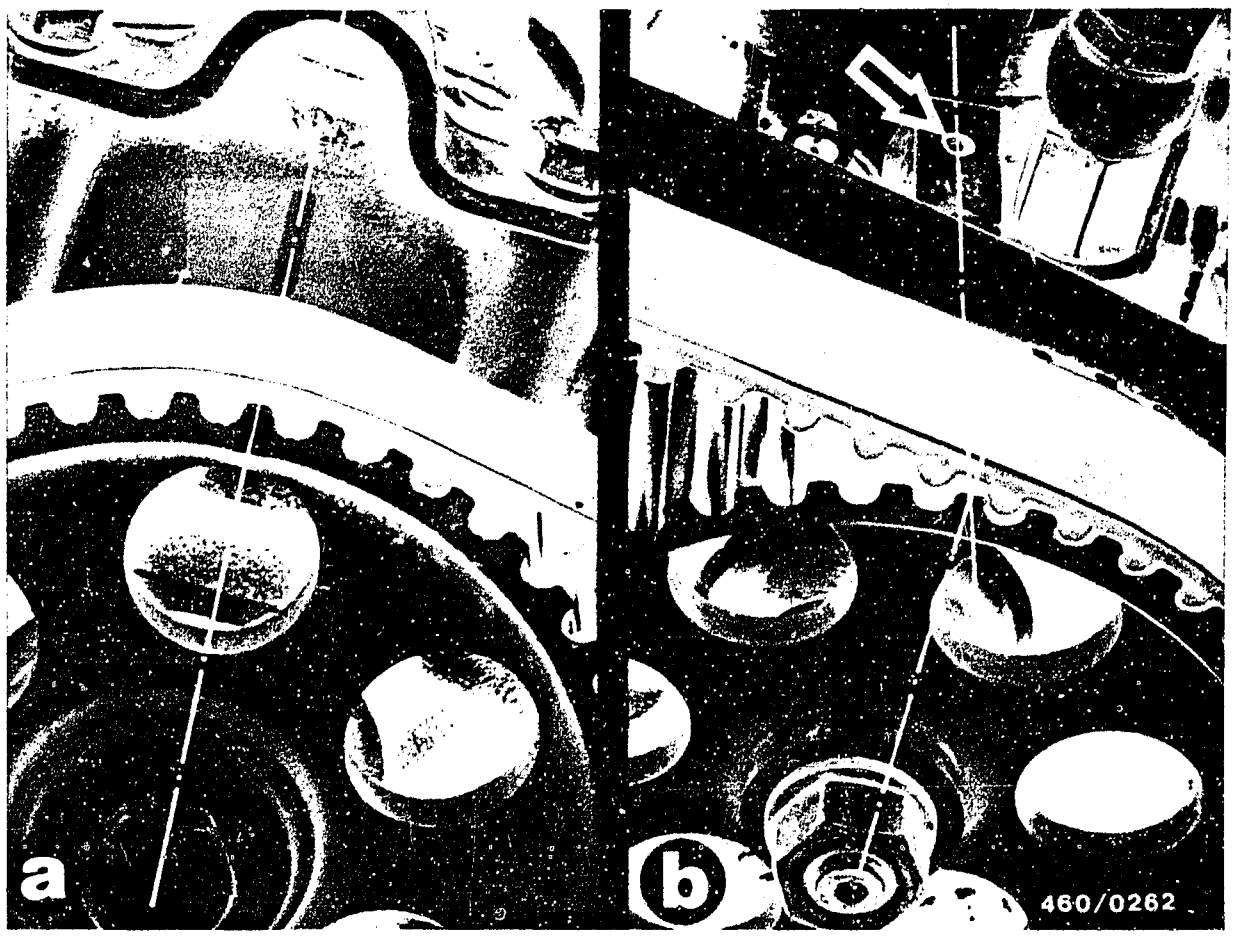
4. Removing the fuel-injection pump

Disconnect the negative lead from the battery.
Remove the headlamp wiper arms.

Remove the fastening screws (Torx screws) from the front panel.
Tilt the front panel slightly forward and remove from the bottom pins.

Remove the cross member (1), side panels (2), and headlamp wiper motors (3).

Pull the radiator up and forwards out of the engine compartment.
Support the radiator from the bottom.

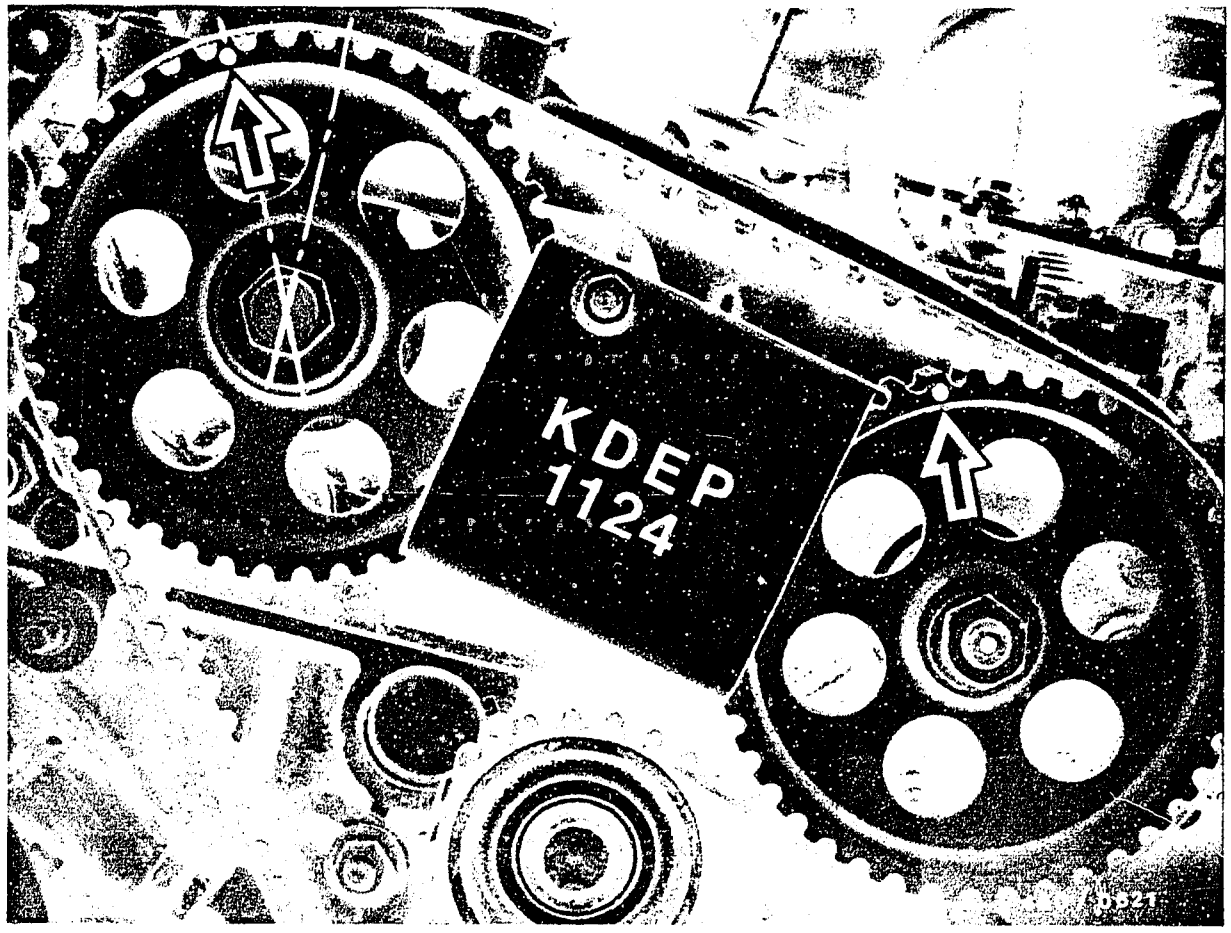


Remove the fan wheel.
Remove the V-belts from the alternator and power steering pump. Take off the toothed-belt cover.

Turn the crankshaft to TDC of cylinder 1.

In this position, the marking on the camshaft gear is aligned with the center axis of the valve cover (Figure a).

The marking on the pump drive gear will then point to the center axis of the governor shaft hole (Figure b).



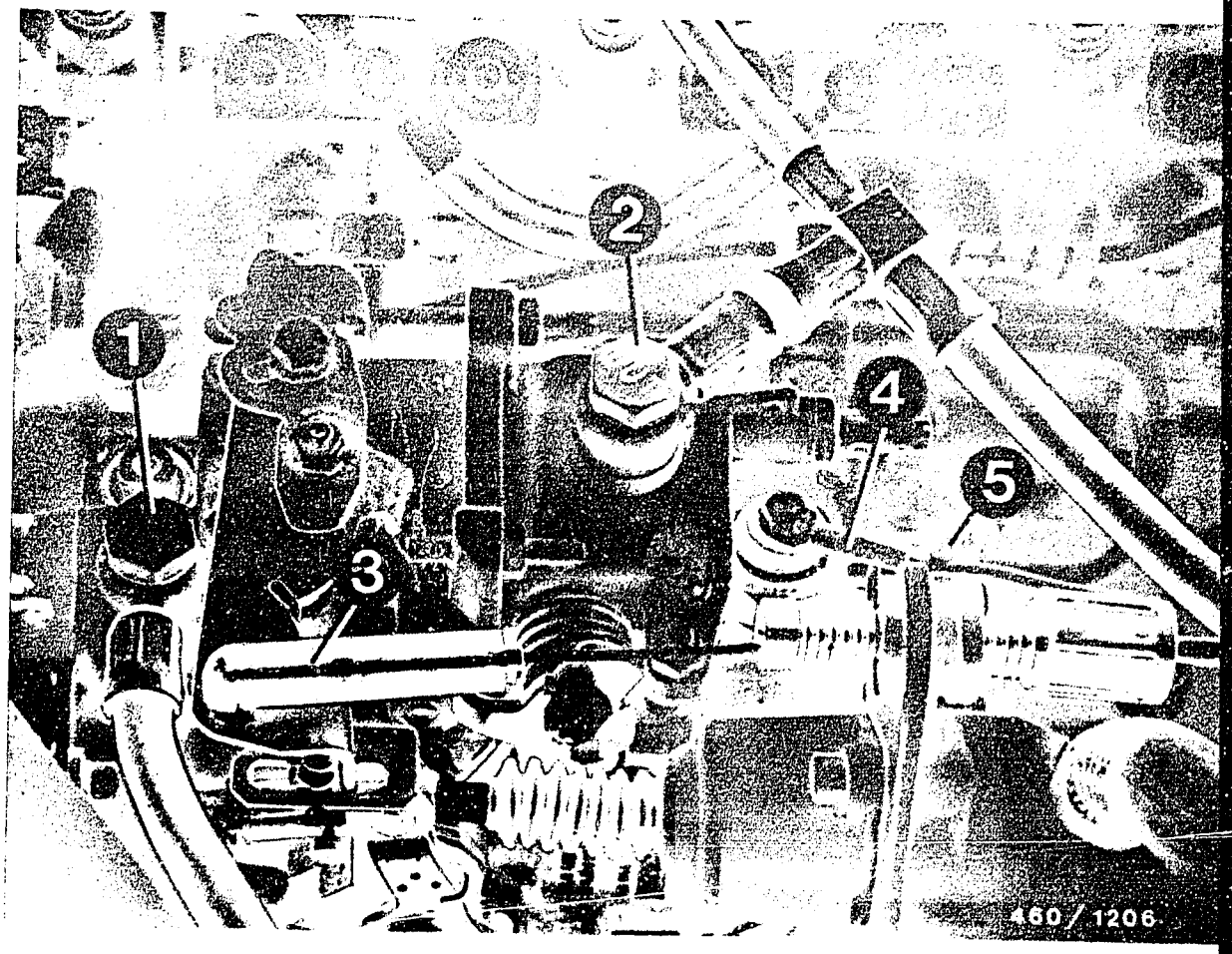
Turn back crankshaft until the mark on the camshaft gear is three teeth before TDC mark on valve cover.

Insert holding device KDEP 1124 between camshaft gear and pump drive gear and secure.

Loosen the fastening nut of the fuel-injection pump gear and unscrew about 2 turns.

Pull off the gear with puller KDEP 1118.

Remove the fastening screw and washer from the fuel-injection pump drive shaft.

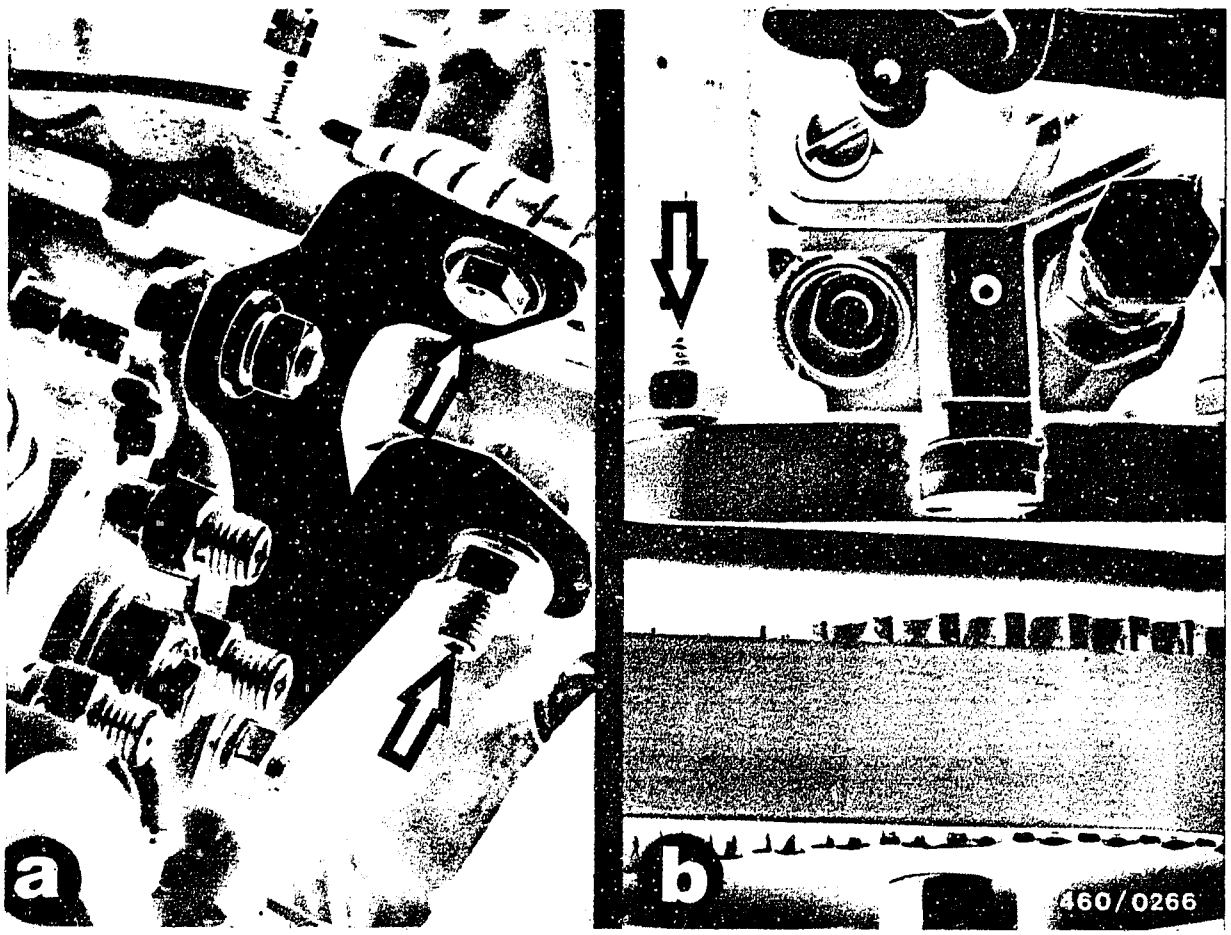


Remove the fuel supply line(1), return line (2), bowden cable at control lever (3), lead for electrical shutoff device (4), and fuel-injection tubing (5). (Counterhold to prevent loosening of the delivery-valve holders).

On the R 25 D-Turbo, remove the charge-air pressure connection (not visible in illustration).

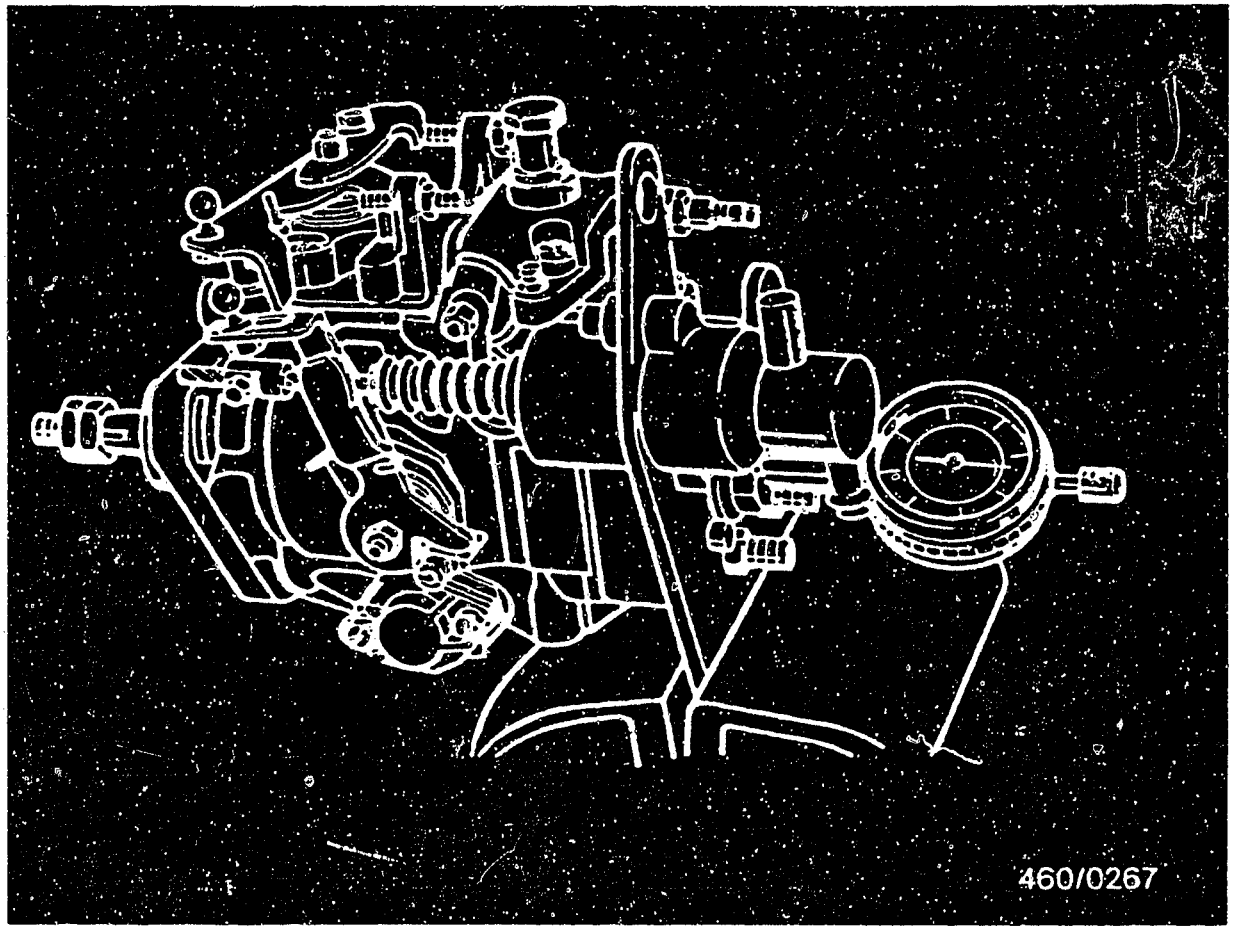
Pinch off the coolant hoses a short distance behind the fuel-injection pump control device using commercially-available spring clips.

Loosen the hose clamps and pull off the coolant hoses.



Unscrew injection pump support bracket fastening screws (arrows, Fig. a).

Remove injection-pump fastening nuts on pump flange and remove injection pump (arrow, Fig. b).



5. Install fuel-injection pump

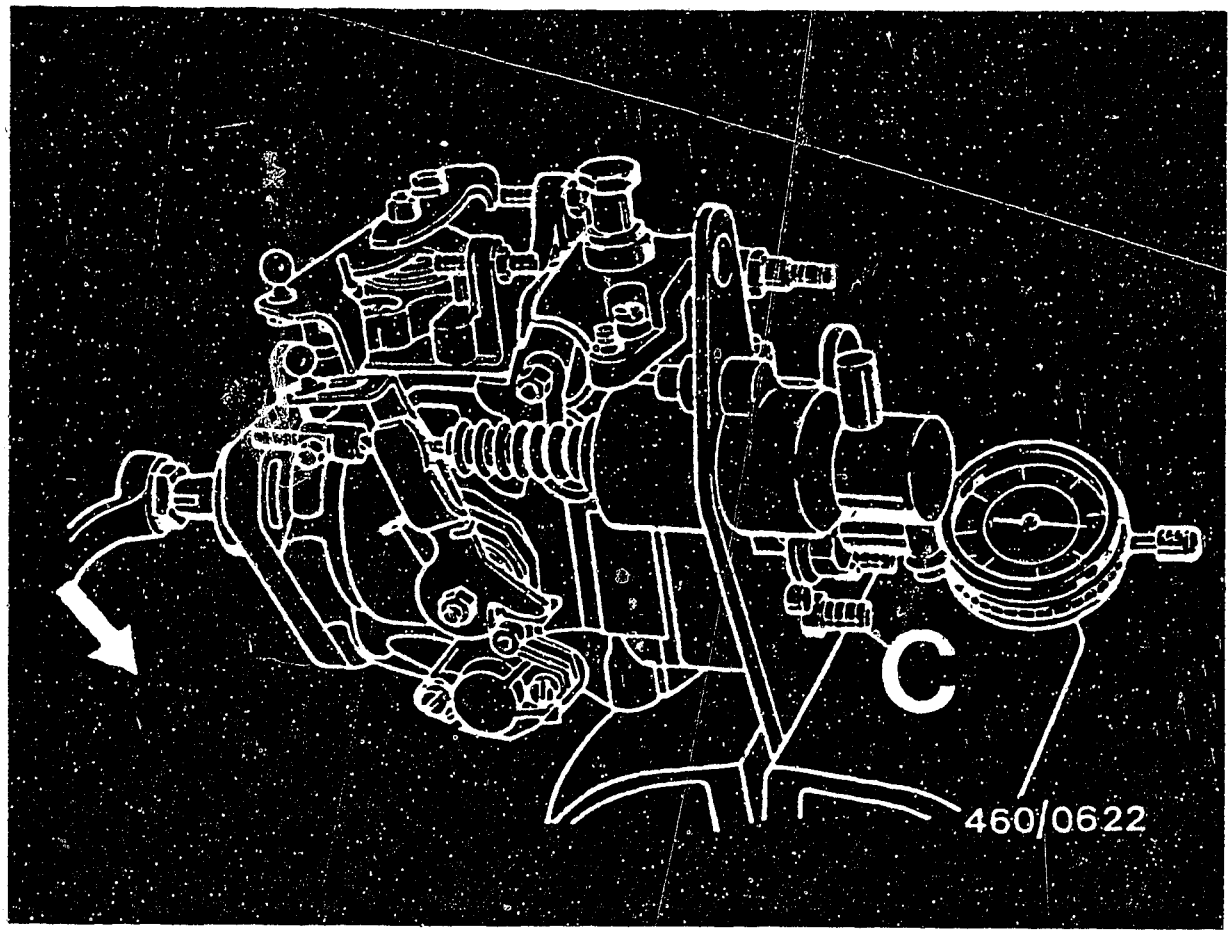
Clamp fuel-injection pump in a vice.

Screw two hexagon nuts onto the injection-pump drive shaft and lock.

Remove injection-pump bleeder screw.

Install measuring device KDEP 1085 with dial indicator 1 687 233 011 in the tapped hole.

Note:
When testing and adjusting start of delivery, the cold-start injection advance (KSB) must be at zero position.

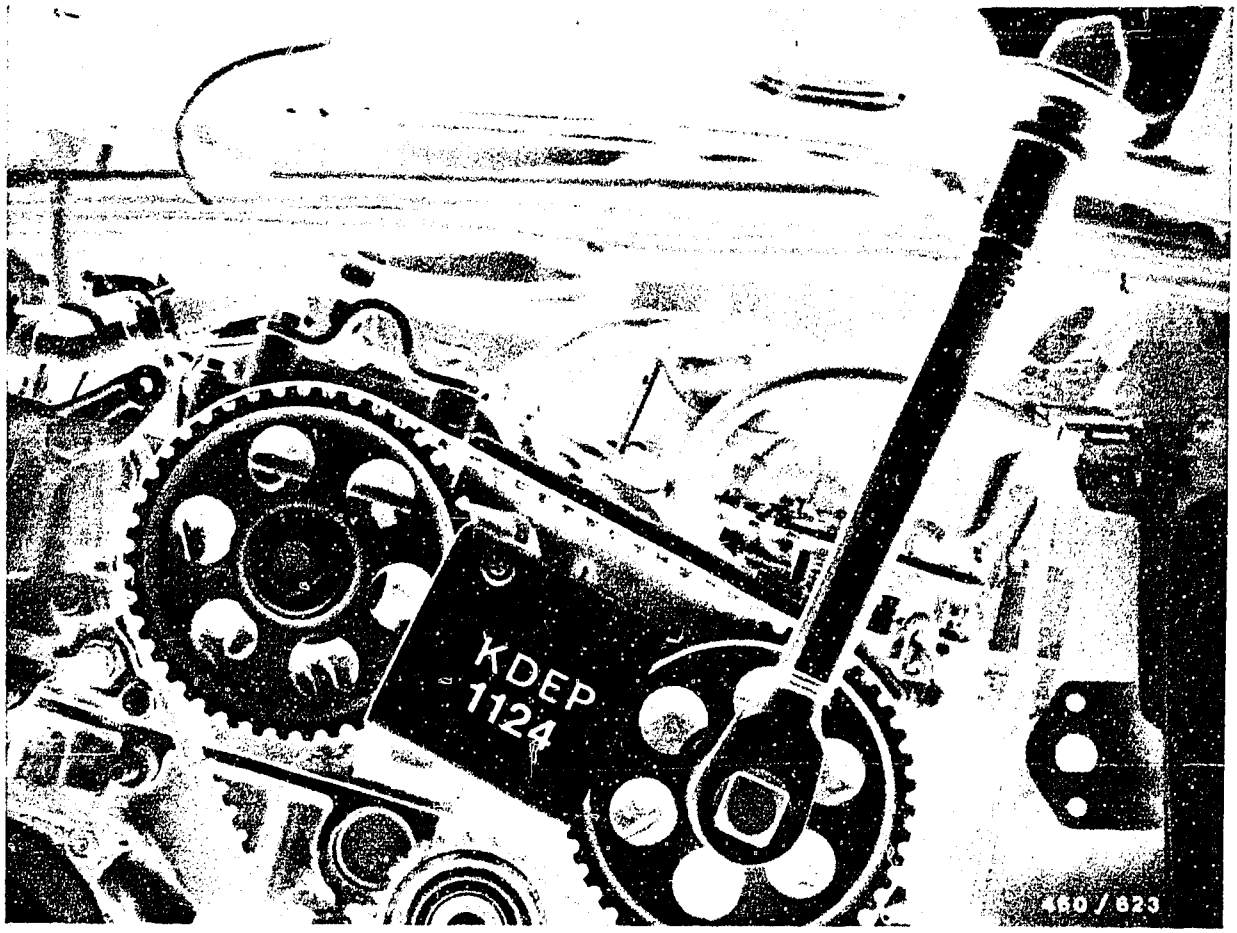


Turn pump shaft in direction of arrow until the distributor-pump plunger reaches its bottom-most position (BDC).

In this position, preload dial indicator by 3 mm and set to "0".

Continue to turn drive shaft in direction of arrow until the V-groove (once again with distributor-pump plunger in BDC position) points to outlet "C" of hydraulic head.

Unscrew hexagon nuts from drive shaft. Do not turn pump shaft any more, with result that distributor-pump plunger remains in BDC position.



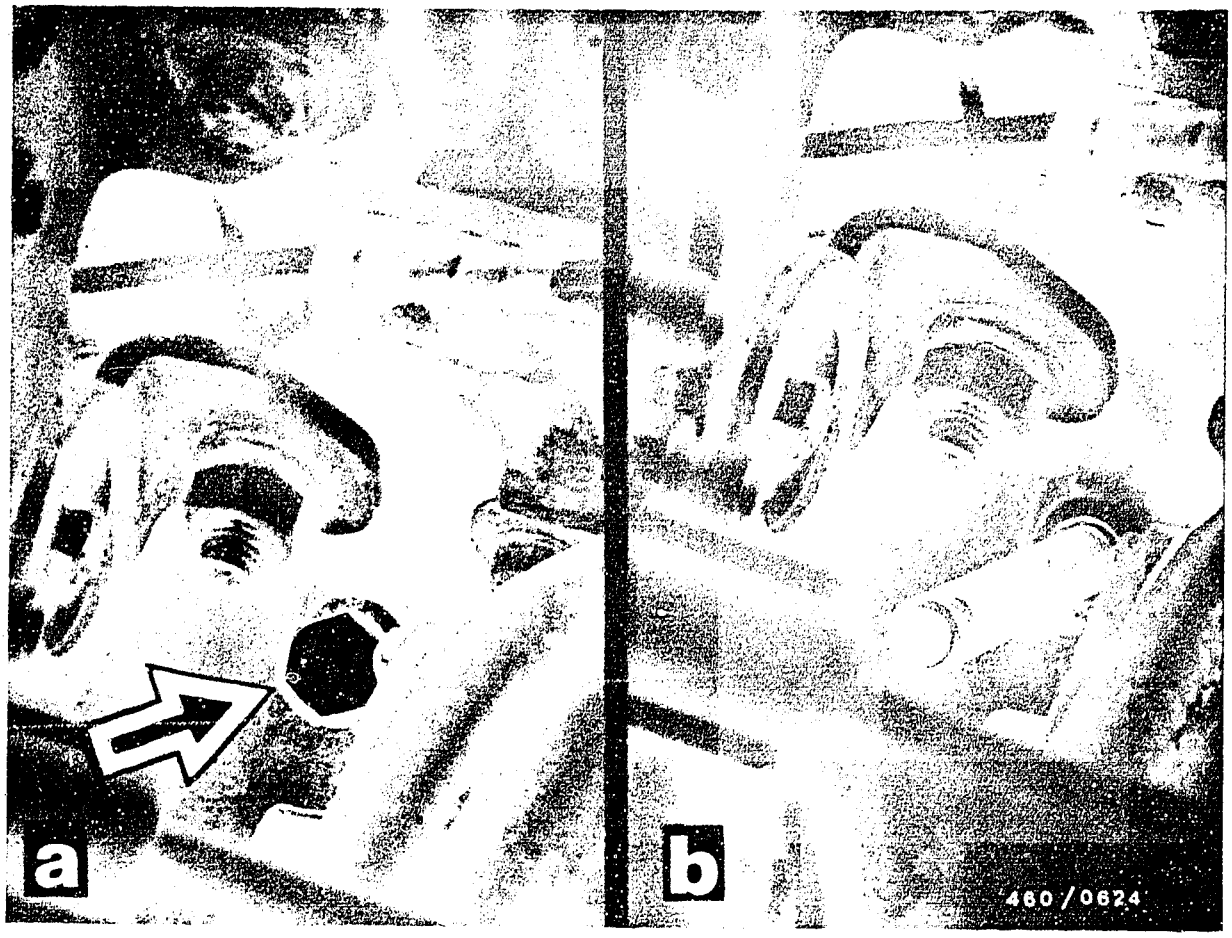
Insert Woodruff key in groove in drive shaft.

Introduce injection pump into bore in pump drive gear.

Screw on fastening nuts of injection pump by hand.

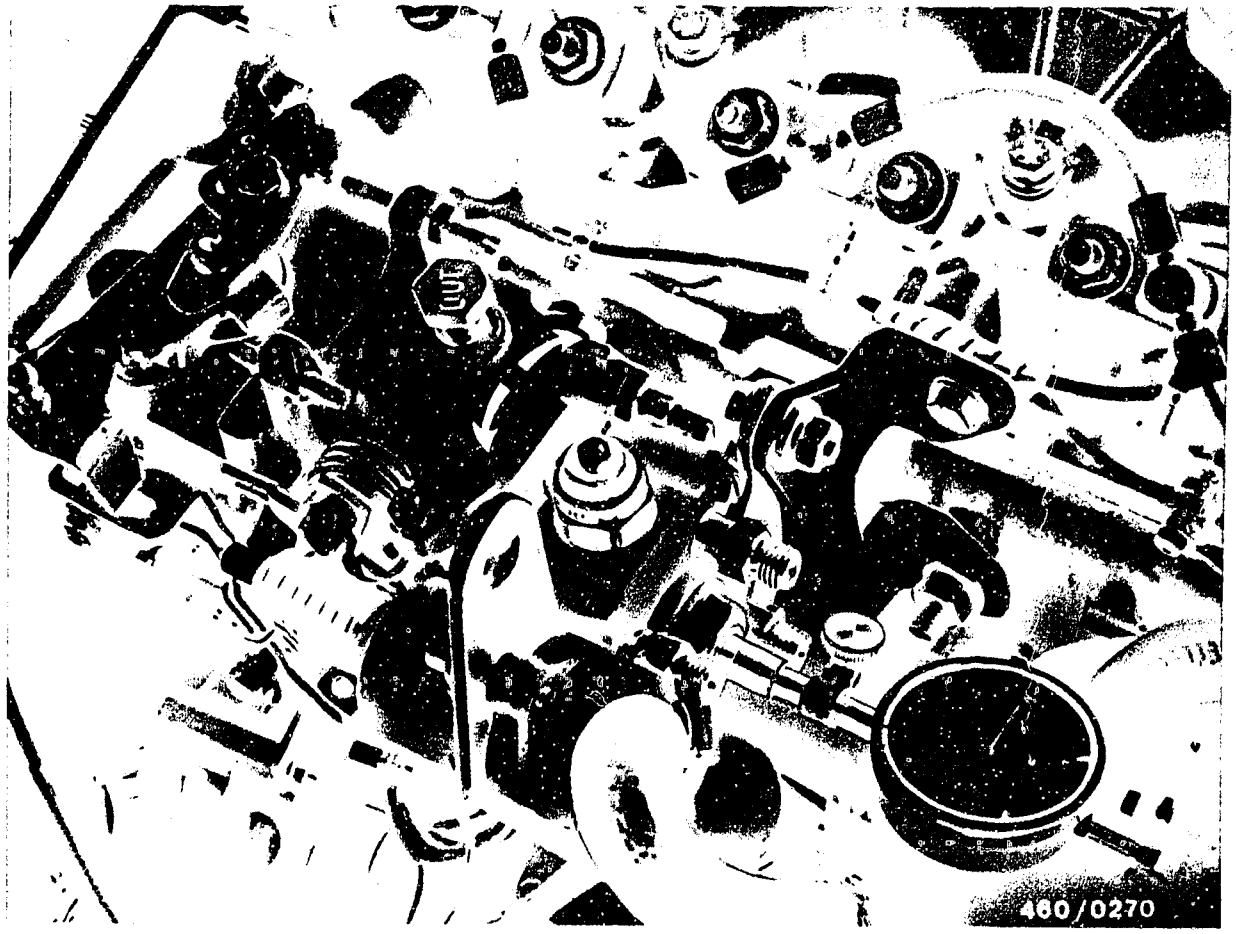
Mount plain washer and fastening nut of pump drive gear and tighten to 50 Nm.

Remove holding device KDEP 1124.



Turn crankshaft over twice in engine direction of rotation and, with cylinder 1 at TDC, fix the position of the crankshaft using setting mandrel KDEP 1123.

To do this, unscrew screw plug on engine block (near injection pump) (arrow, Fig. a) and insert setting mandrel (Fig. b).



In this position, the dial indicator on the injection pump must indicate a piston stroke of 0.70 mm.
If necessary, correct by pivoting the injection pump.

Testing the setting

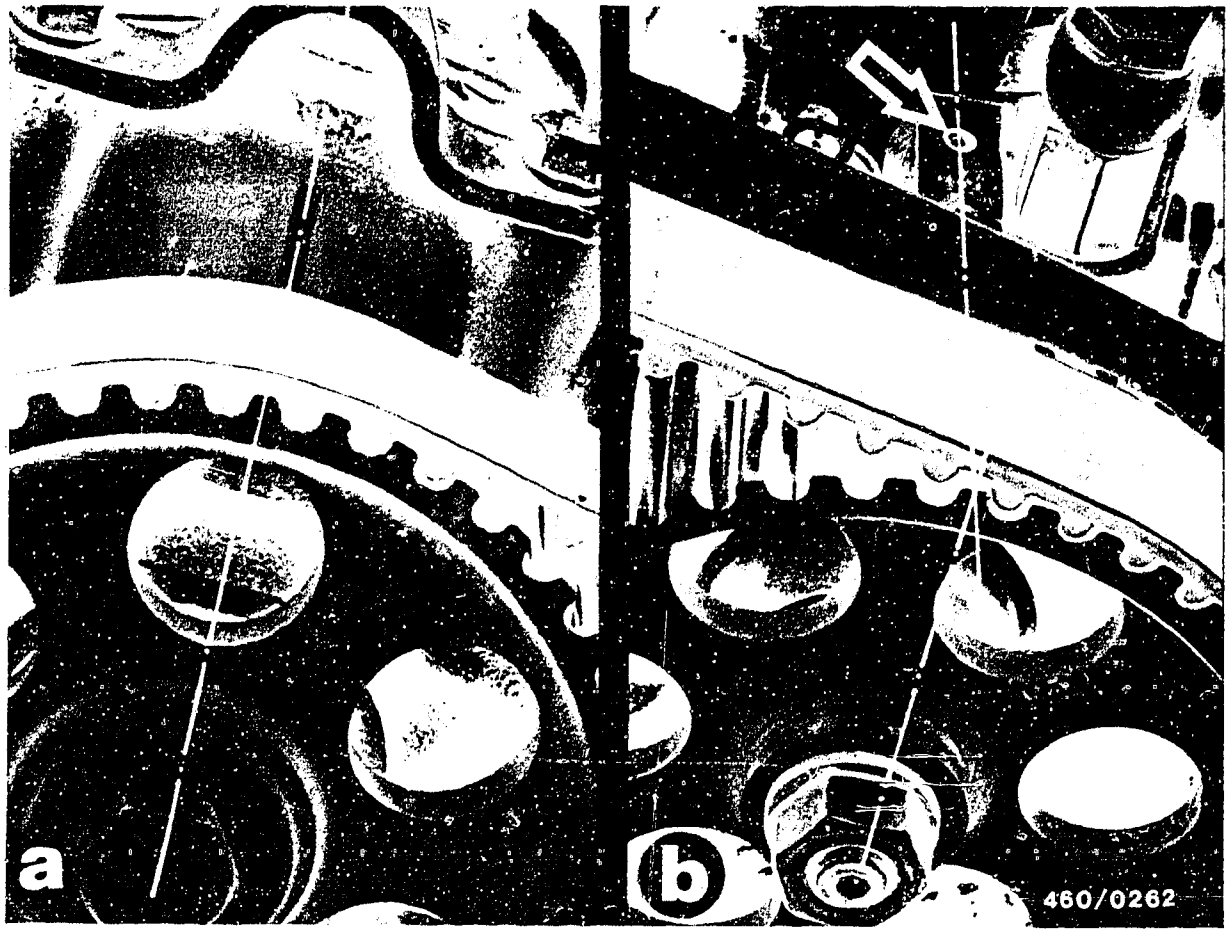
Remove setting mandrel KDEP 1123.

Turn crankshaft 1 3/4 turns in direction of rotation.

Check whether dial indicator is at "0" with distributor-pump plunger in BDC position.

Turn crankshaft further as far as TDC position (engine) and lock with setting mandrel KDEP 1123.

The dial indicator on the injection pump must indicate a piston stroke of 0.68 ... 0.72 mm.



With engine in this position, test the position of the timing gears:

Mark on camshaft gear must align with the centre line of the pipe bend on the valve cover (Fig. a).

Mark on pump drive gear points to the centre line of the governor shaft bore (arrow, Fig. b).

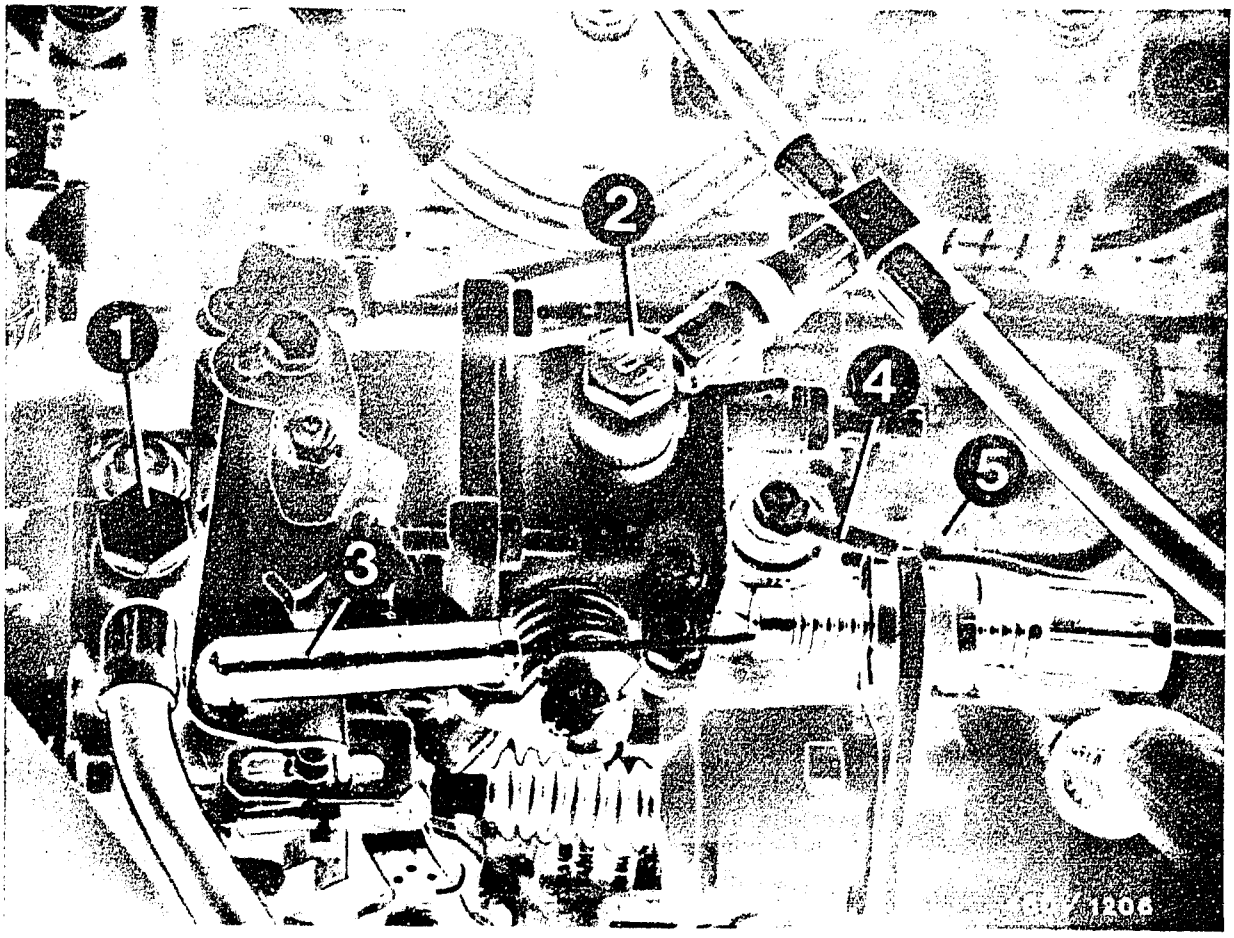
Remove setting mandrel KDEP 1123.

Tighten injection-pump fastening nuts to 25 Nm.

Remove measuring tool KDEP 1085 with dial indicator and fit bleeder screw with new copper seal ring.

Mount support bracket on injection-pump hydraulic head and tighten fastening screws.

Install the toothed-belt cover.

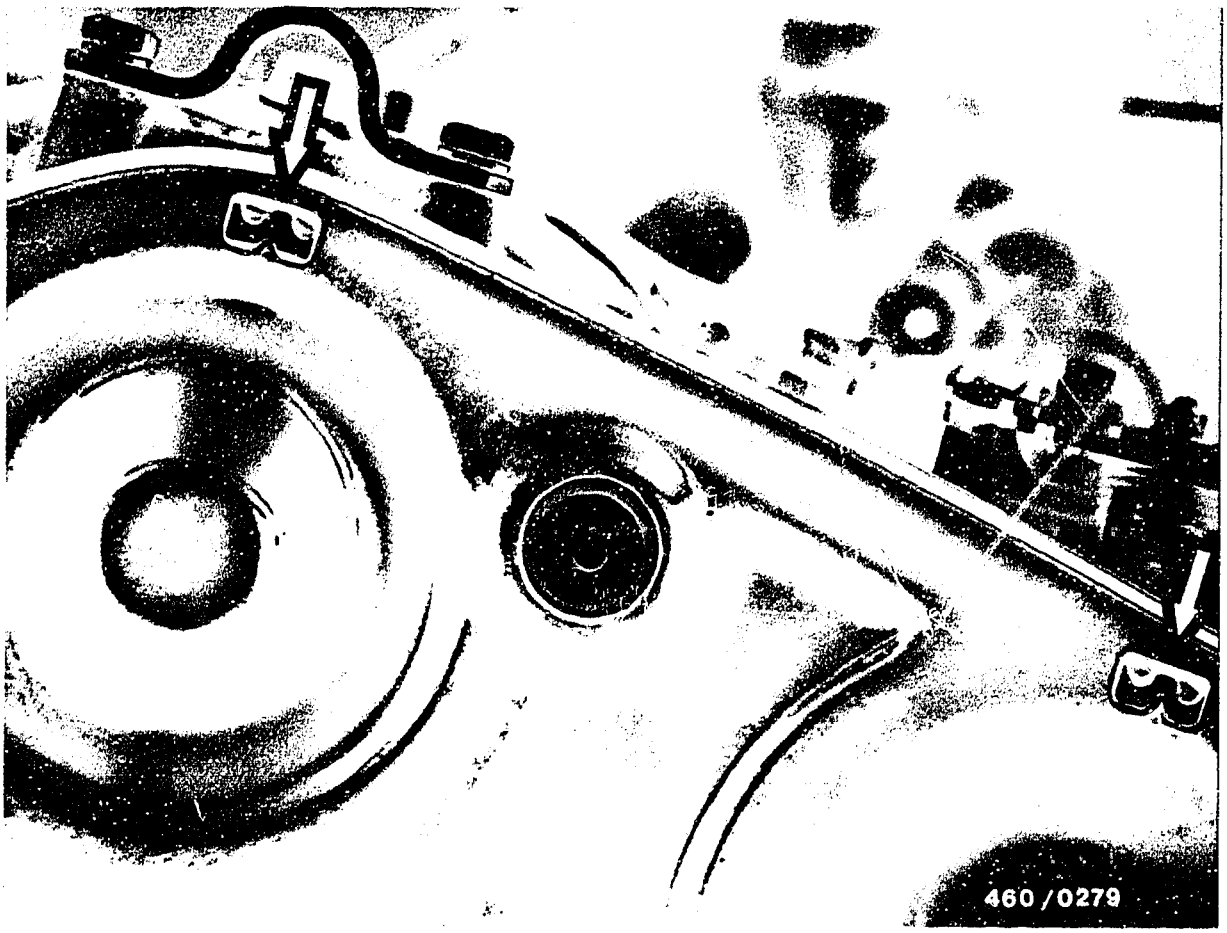


Install the fuel supply line (1), return line (2), bowden cable at the control lever (3), lead for electrical shutoff device (4), and fuel-injection tubing (5). (Counterhold to prevent turning of the delivery-valve holders).

On the R 25 D-Turbo, install the charge-air pressure connection.

Connect the negative lead to the battery and the coolant hoses to the control device of the fuel-injection pump.

Mount the V-belts for the alternator and power steering pump, the fan wheel, radiator, cross member, side panels, headlamp wiper motors, and front panel.



6. Testing and adjusting engine timing

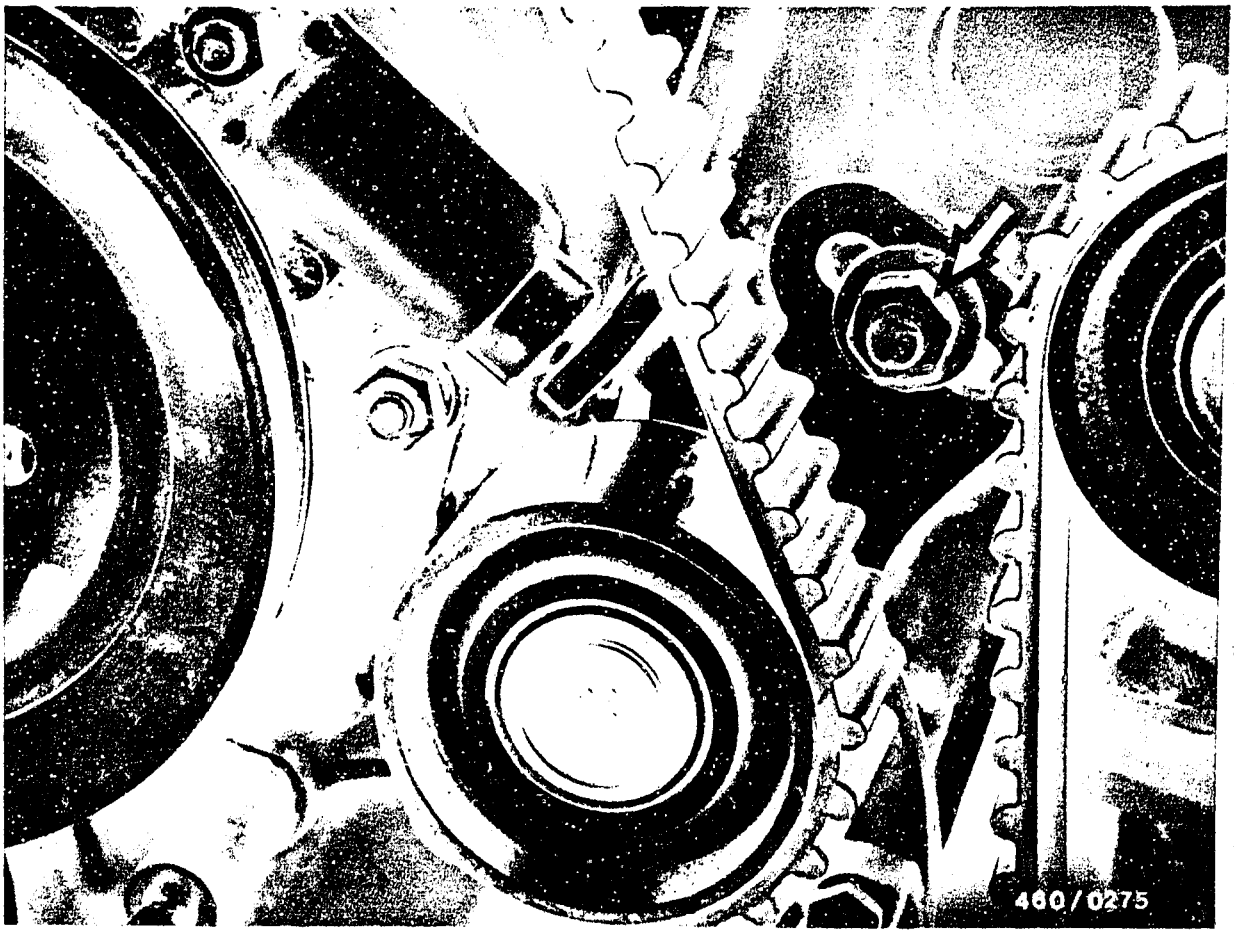
6.1 Testing engine timing

Turn the crankshaft to TDC of cylinder 1, and hold in this position with setting mandrel KDEP 1123.

Check whether the markings on the camshaft and fuel-injection pump gears are aligned with the pointers of the adjustment windows (illustration).

The marking on the crankshaft gear points vertically upwards.

If these markings do not align with their reference marks, adjust the engine timing.



6.2 Adjusting engine timing

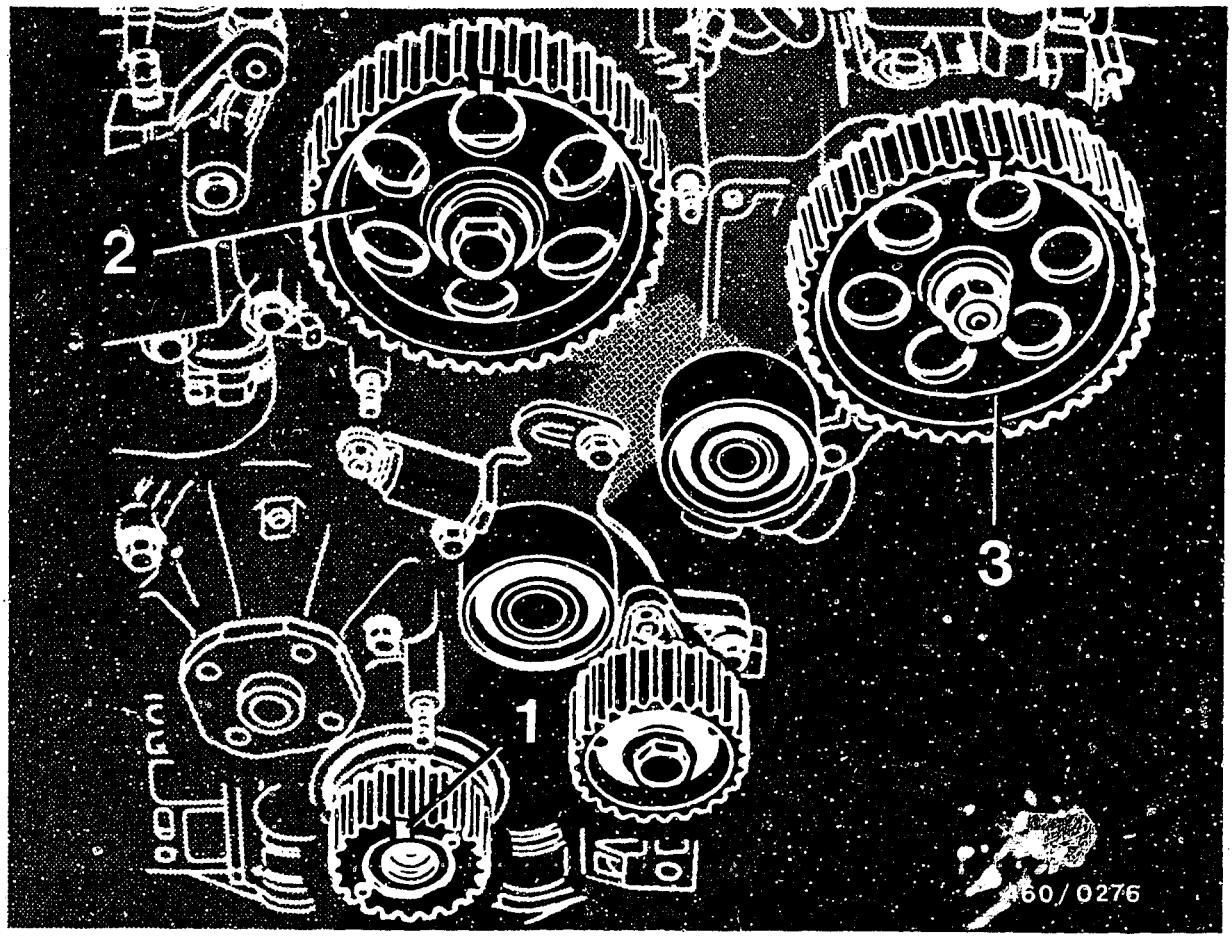
Remove the V-belts from the alternator and power steering pump.

Take off the V-belt cover.

Loosen the fastening nuts (arrow) of the tensioning-wheel bracket.

Press the tensioning wheel against the spring tensioner and tighten the fastening screw of the bracket.

Remove V-belts.

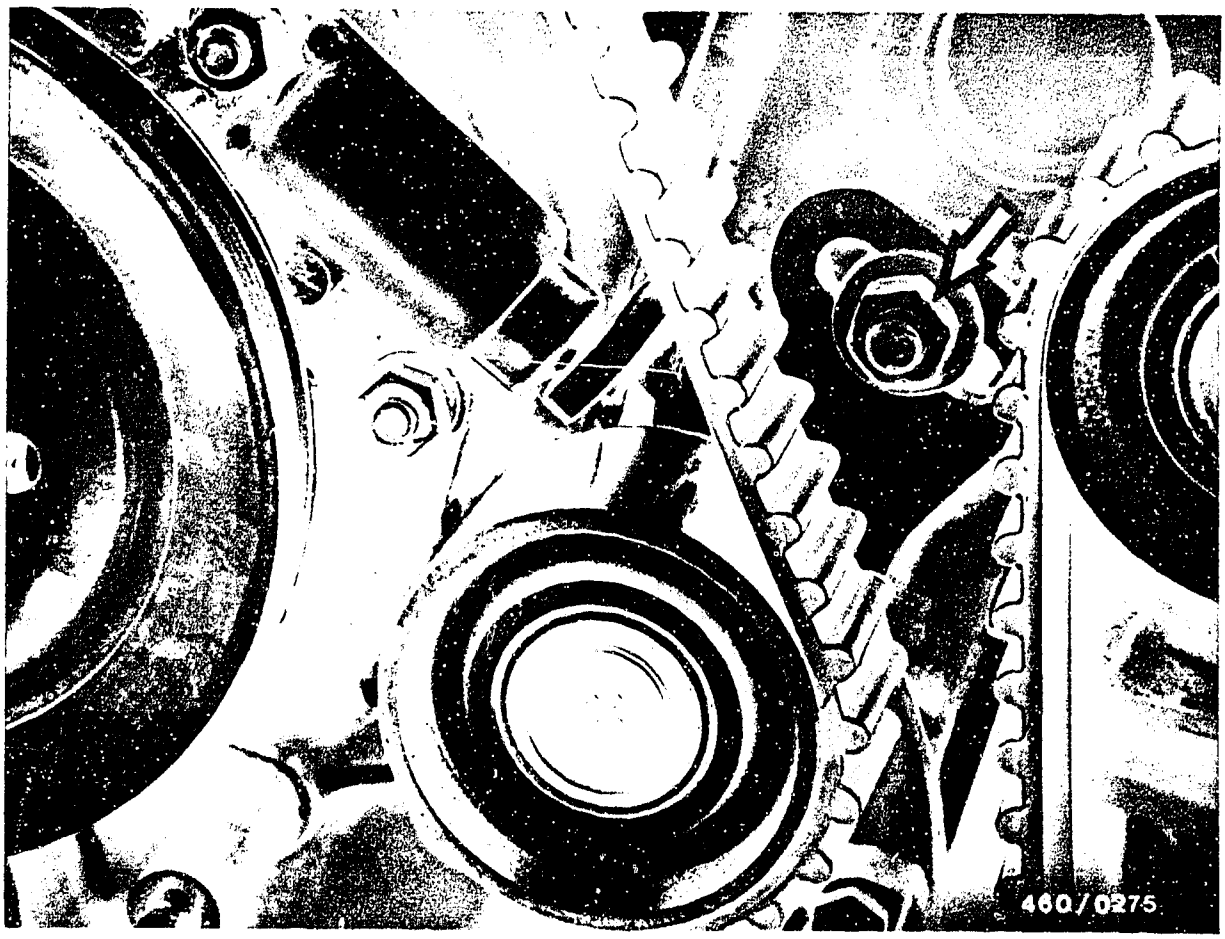


The mark on the crankshaft gear (1) must point vertically upward.

Turn camshaft gear (2) so that mark on camshaft gear aligns with centre line of valve cover.

The mark on the pump drive gear (3) points to the centre line of the governor shaft bore.

By provisionally mounting the toothed-belt cover it is possible to check the correct position of camshaft gear and injection-pump drive gear through inspection holes.



Put on the toothed belt without moving the drive gears.

Loosen tensioning wheel bracket fastening screw.

Remove setting mandrel KDEP 1123.

Turn crankshaft over two full times in engine direction of rotation until marks are again in alignment.

Tighten tensioning wheel bracket fastening screw.

Check toothed-belt tension using belt-tension testing tool KDEP 1121.

Setting value: Scalar value 14 ... 15

Mount V-belt cover.
Position and tension V-belts for the alternator and power steering pump. Test and if necessary adjust the coordination of the fuel-injection pump and the engine.

7. Test charge-air pressure

When working on the turbocharger, it should be noted that even the smallest particles of dirt can lead to the destruction of the turbocharger.
Therefore, never operate the engine without air filter.

To test the charge-air pressure, it is possible to use the pressure tester KDJE-P 100 or a pressure gauge 0...1,6 bar (e. g. Wika No. 4184).

7.1 Measuring the charge-air pressure

The charge-air pressure is measured at full load, if possible on chassis dynamometer, at 2250 ± 250 min^{-1} in the range from 80 ... 100 km/h in 5th gear.

Read off charge-air pressure on pressure gauge.

Set value: 0.6 bar ± 0.025

Note:

To assess the exhaust-gas turbocharger, it is essential that the start of delivery and nozzle-opening pressure be correctly set, that the air-intake and exhaust systems do not have any leaks, and that the engine (valve clearance, compression pressure) is in good mechanical condition.

If the charge-air-pressure control valve is defective, replace the exhaust turbo-supercharger.

After installing a new exhaust turbo-supercharger, fill the supercharger with oil and let the engine run for approx. 1 minute in idle in order to assure oil supply to the supercharger.